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ABSTRACT

Conducted by the Wisconsin Nutrition Education and Training (NET) program, this study was designed to (1) assess public and private elementary school teachers' and public school food managers' nutrition knowledge, and (2) to ascertain their opinions on various topics related to nutrition education. The first section of the report provides background information on the development of the Wisconsin NET program and its goals. Information on how the statewide survey was conducted is also included. This section is followed by two major sections. The first describes the development of the Nutrition Knowledge Test and the survey results for this test. The second section presents the survey findings regarding subjects' opinions on the following: the effects of nutrition instruction on students' eating habits; teaching approaches to nutrition education; respondents' perceptions of their levels of nutrition knowledge; and use of the lunchroom as a laboratory for learning about nutrition. More than half of the report consists of six appendices, including general behavioral and performance objectives related to the Informed Food Choice Model; a copy of the Wisconsin NET Nutrition Knowledge Test; the items used to elicit food service managers' and teachers' opinions on nutrition related topics and; copies of letters and directions sent to study participants; a copy of the Nutrition Knowledge Test answer sheet; and item statistics for the Nutrition Knowledge Test. (Author/MP)

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# A SURVEY OF NUTRITION KNOWLEDGE AND OPINIONS OF WISCONSIN ELEMENTARY TEACHERS AND FOOD SERVICE MANAGERS

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CONTENTS

List of Tables . . . . . iv

SECTION ONE: BACKGROUND . . . . . 1
NET Program . . . . . 1
Statewide Survey . . . . . 2

SECTION TWO: NUTRITION KNOWLEDGE TEST . . . . . 4
Test Development . . . . . 4
Findings . . . . . 5

SECTION THREE: OPINIONS REGARDING TOPICS RELATED TO NUTRITION EDUCATION . . . . . 21
Effects of Nutrition Instruction . . . . . 21
Philosophy and Approaches Regarding Nutrition Education . . . 24
Perceptions of Nutrition Knowledge . . . . . 31
Lunchroom as a Learning Laboratory . . . . . 34
Summary of Findings . . . . . 36
Discussion . . . . . 38

APPENDIX A: General Behavioral Objectives and Performance Objectives Describing the Informed Food Choice Model . . . . . 41

APPENDIX B: Wisconsin NET Nutrition Knowledge Test . . . . . 47

APPENDIX C: Food Service Manager Opinion Items . . . . . 55

APPENDIX D: Teacher Opinion Items . . . . . 57

APPENDIX E: Letters and Directions . . . . . 59

APPENDIX F: Test Answer Key . . . . . 63

APPENDIX G: Item Statistics for Wisconsin NET Nutrition Knowledge Test . . . . . 65

LIST OF TABLES

1. Nutrition Knowledge Test Score Distributions for Public School Elementary Teachers by Multi-CESA Region . . . . . 6

2. Nutrition Knowledge Test Score Distributions for Food Service Managers by Multi-CESA Region . . . . . 7

3. Nutrition Knowledge Test Score Distribution for Private School Elementary Teachers . . . . . 8

4. Item Analysis Matrix Showing Responses to Item Options by Public School Elementary Teachers in Each Fifth of Test Score Distribution . . . . . 17

5. Distributions of Item Difficulty Indices from NET Nutrition Knowledge Test for Food Service Managers and Public School Elementary Teachers . . . . . 18

6. Distributions of Point-Biserial Correlation Coefficients from NET Nutrition Knowledge Test for Food Service Managers and Public School Elementary Teachers . . . . . 20

## SECTION ONE
## BACKGROUND

This report presents the results of a statewide survey of elementary teachers from public and private schools and public school food service managers. The survey was conducted by the Wisconsin Nutrition Education and Training (NET) program to assess their nutrition knowledge and to ascertain their opinions on various topics related to nutrition education.

The first part of the report provides background information about the Wisconsin NET program and about how the survey was conducted. This background section is followed by two major sections. The first describes the development of the nutrition knowledge test and the survey results for this test. The second section presents the survey findings regarding opinions about the various nutrition education topics.

### NET Program

The Nutrition Education and Training Program (NET) was created at the national level in 1977 by PL 95-166, and began in Wisconsin in July, 1978 with the receipt of advance planning funds from the United States Department of Agriculture. The Federal legislation directs the Department of Agriculture to make funds available to state educational agencies to (A) instruct students with regard to the nutritional value of foods and the relationship between food and human health, (B) train food service personnel in the principles and practices of food service management, (C) instruct teachers in sound principles of nutrition education, and (D) develop and use classroom materials and curricula.

In Wisconsin, the NET program is administered through the state Department of Public Instruction (DPI), Food and Nutrition Services Section. At the local level, NET services are provided to public and private schools by means of contracts with Cooperative Educational Service Agencies (CESA).

The Wisconsin NET program has established the following four broad program goals:

1. To facilitate a nutrition education process which permits Wisconsin children to make informed food choices during their formative years.

2. To enhance the ability of teachers to integrate sound nutrition information into the curriculum, utilizing innovative teaching techniques at each grade level.

3. To delineate and strengthen the role of school food services personnel in the food service and nutrition education process.

4. To identify, compile, evaluate and/or develop nutrition education curriculum materials.

The ultimate goal for the Wisconsin NET program which these four goals aim to facilitate is "to assist in providing students with adequate information and in promoting proper attitudes so that they can make informed choices about the foods they eat."

Statewide Survey

The survey of nutrition knowledge was designed to assess the knowledge levels and opinions regarding selected nutrition-related topics of three populations: public school elementary teachers, private school elementary teachers, and public school food service managers. Because Wisconsin is divided into six multi-CESA regions for the purpose of delivering NET services to public and private schools, the survey was designed to yield information from each region about the public school elementary teachers and food service managers. Data about these two populations were also to be generalized to the state as a whole. For private school elementary teachers, only information generalizable to the state as a whole was sought, because private schools were very unevenly distributed among the six multi-CESA regions. A feasible sampling plan for private school food service managers could not be developed, so they were not included in the study.

A contract to perform the sampling, mailing and necessary follow-up was negotiated with the Wisconsin Survey Research Laboratory, University of Wisconsin--Extension (WSRL). Arrangements were made for test scoring and item analyses with the University of Wisconsin--Madison Testing and Evaluation Services.

A sample of 120 public school elementary teachers was drawn from each of the six multi-CESA regions by a method which ensured that each teacher within the region would have an equal probability of being selected. From a list of private schools throughout Wisconsin known to include elementary teachers, 120 schools were selected with probability proportional to the estimated number of elementary teachers in each school. The administrator of each of these schools was sent a letter explaining the study and requesting his/her participation by sending WSRL a list of their teachers. Sixty-seven private schools returned such a list and 112 private school elementary teachers were selected from these schools by a method ensuring each teacher an equal probability of being selected. All of the public school's food service managers were included in the study; no sampling was involved.

Each of the persons so selected was sent a copy of the appropriate form of the knowledge test and opinion items (the knowledge test items were the same for all groups; some of the opinion items for food service managers and teachers differed), an optical scan answer sheet, directions, and a postage paid return-addressed envelope for returning the answer sheet. Initial mailing was done in early April 1980, and a follow-up package was sent two weeks later to non-respondents. As an incentive to complete the test, all respondents were promised an answer key to the test, which was mailed after receipt of the answer sheet. (Examples of these materials are in Appendices B-F.)

The response rates after follow-up for the three groups were as follows:

| | Food Services Managers | Public School Teachers | Private School Teachers |
|---|---|---|---|
| Number Mailed | 385 | 720 | 112 |
| Number Returned | 301 | 441 | 64 |
| Percent Returned | 78% | 61% | 57% |

The returned answer sheets were cleaned of any stray marks and optically scanned. The tests were scored, the items were subjected to standard item analyses, and score distributions for each of the regions were prepared. The response summaries for each of the opinion items were also tabulated.

## SECTION TWO
## NUTRITION KNOWLEDGE TEST

This section describes the development of the nutrition knowledge test and presents the findings of the survey.

### Test Development

As part of the developmental phase for this nutrition knowledge test, a search was conducted for existing nutrition knowledge tests. Although many tests were identified, few were found which had been based on an identified conceptual framework or a set of objectives. None were found which adequately matched the Wisconsin NET program philosophy and the conceptual model of informed food choice. Therefore, the Nutritional Sciences Department of UW-Madison/Extension, which had a contract to provide technical support to the Wisconsin NET program, was asked to develop a knowledge test for elementary teachers. Primary responsibility for the development of this test rested on Elaine D. Retholtz, who developed it as part of her Masters Thesis in nutritional sciences.

The first phase of the development of this test was to perform a goal analysis which sought to answer the question: "What would we want an individual to be able to do or say in order to demonstrate to our satisfaction that he or she could make informed food choices?" A list of general behavioral objectives was generated in answer to this question. This list was subsequently modified and refined through review by the Wisconsin NET staff and the University of Wisconsin nutritional sciences staff associated with the Wisconsin NET program. Once these general behavioral objectives were judged acceptable, they served as the basis for the development of performance objectives. (See Appendix A.) These were behaviors which were measurable using a multiple-choice test item format. It was found that all but one of the twenty-two general behavioral objectives could be adequately reflected in this format. A number of items relating to each of the other objectives were developed.

The resulting multiple-choice items were screened for content validity by a panel of twenty-six nutritionists, were revised, and were then reexamined by

the Wisconsin NET staff and UW-Madison/Extension NET Project staff. The resulting items were organized into two parallel-form tests of 40 items each with twelve items in common to both tests. The two forms of the test were pilot tested during the fall 1979 semester with three separate populations from the University of Wisconsin - Madison campus. These populations were: 90 students in a health education class for future teachers, 20 students in a nutritional sciences class who had taken one previous college course in nutrition, and 22 graduate students in nutritional sciences who had taken two or more college courses in nutrition. One half of each group took one form of the pilot test, the other half took the other form. The two forms were distributed randomly within each group.

The results of this pilot testing were subjected to several statistical and logical analyses. On the average, the graduate students and students having taken at least one previous college course in nutrition scored nine points higher than students in the health education class for future teachers, which indicated concurrent validity. An analysis of the responses to the twelve items which were the same on both forms of the test indicated that the random distribution of forms within each group had been successful -- there were no systematic variations on the twelve common items within each group between those receiving one form or the other.

As part of the statistical analyses of the pilot tests, the test items were subjected to an item analysis. Items were revised or eliminated on the basis of this analysis. The final result of this winnowing and sifting process was one test of 42 items, which could be used to assess the nutrition knowledge of elementary teachers or of high school seniors. This test was used with each of the three populations surveyed in this study. (See Appendix B.)

Findings

Complete score distributions for each of the target populations are displayed in Tables 1, 2 and 3. In general, these score distributions show that the test was not too hard or too easy for the respondents, that there was considerable spread in their knowledge levels, but very little region-to-region variation in the average knowledge scores or their spread. The statewide average of 29.2 for public school elementary teachers is identical to the statewide average for food service managers, and very close to the average of

TABLE 1

NUTRITION KNOWLEDGE TEST SCORE DISTRIBUTIONS FOR
PUBLIC SCHOOL ELEMENTARY TEACHERS BY MULTI-CESA REGION

| SCORE | MULTI-CESA REGION | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1, 2 & 7 | 4, 5 & 6 | 3,8,9 & 10 | 11,12 & 14 | 13,15 & 17 | 16,18 & 19 | STATEWIDE |
| 40 | | | 1 | | | | 1 |
| 39 | | | 1 | | | | 1 |
| 38 | 2 | 1 | 0 | | 1 | | 4 |
| 37 | 2 | 2 | 0 | 3 | 1 | 3 | 11 |
| 36 | 2 | 0 | 3 | 2 | 2 | 0 | 9 |
| 35 | 4 | 2 | 4 | 7 | 4 | 4 | 25 |
| 34 | 6 | 7 | 2 | 5 | 5 | 3 | 28 |
| 33 | 5 | 3 | 9 | 5 | 5 | 7 | 34 |
| 32 | 8 | 6 | 10 | 3 | 4 | 5 | 36 |
| 31 | 5 | 4 | 6 | 6 | 8 | 1 | 30 |
| 30 | 9 | 9 | 6 | 9 | 3 | 3 | 39 |
| 29 | 11 | 8 | 8 | 2 | 5 | 4 | 38 |
| 28 | 6 | 9 | 3 | 7 | 5 | 3 | 33 |
| 27 | 3 | 3 | 6 | 9 | 4 | 5 | 30 |
| 26 | 2 | 10 | 6 | 5 | 5 | 4 | 32 |
| 25 | 4 | 2 | 2 | 4 | 7 | 3 | 22 |
| 24 | 5 | 6 | 5 | 3 | 4 | 3 | 26 |
| 23 | 4 | 2 | 1 | 1 | 2 | 0 | 10 |
| 22 | 0 | 1 | 3 | 0 | 2 | 1 | 7 |
| 21 | 3 | 0 | 2 | 0 | 2 | 0 | 7 |
| 20 | 2 | 0 | 0 | 1 | 3 | 4 | 10 |
| 19 | 0 | 1 | 0 | | 2 | 0 | 3 |
| 18 | 0 | 1 | 0 | | | 1 | 1 |
| 17 | 1 | | 1 | | | 1 | 3 |
| 16 | | | 0 | | | | 0 |
| 15 | | | 0 | | | | 0 |
| 14 | | | 0 | | | | 0 |
| 13 | | | 1 | | | | 1 |
| Number | 84 | 77 | 80 | 72 | 74 | 54 | 441 |
| Average | 29.3 | 29.0 | 29.3 | 30.0 | 28.5 | 29.1 | 29.2 |
| Median | 29.6 | 28.9 | 29.8 | 29.9 | 28.7 | 29.3 | 29.4 |
| Std. Deviation | 4.55 | 4.00 | 4.73 | 3.91 | 4.78 | 4.90 | 4.48 |
| Reliability (KR-20) | 0.68 | 0.58 | 0.71 | 0.57 | 0.71 | 0.73 | 0.67 |

TABLE 2

NUTRITION KNOWLEDGE TEST SCORE DISTRIBUTIONS FOR
FOOD SERVICE MANAGERS BY MULTI-CESA REGION

| SCORE | MULTI-CESA REGION | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1, 2 & 7 | 4, 5 & 6 | 3,8,9 & 10 | 11,12 & 14 | 13,15 & 17 | 16,18 & 19 | STATEWIDE |
| 42 | | | | 1 | 2 | | 3 |
| 41 | 1 | | | 1 | 0 | 1 | 3 |
| 40 | 1 | 1 | | 0 | 0 | 1 | 3 |
| 39 | 1 | 0 | | 0 | 0 | 4 | 5 |
| 38 | 0 | 1 | 1 | 0 | 1 | 4 | 7 |
| 37 | 2 | 0 | 1 | 0 | 1 | 1 | 5 |
| 36 | 2 | 2 | 1 | 1 | 3 | 2 | 11 |
| 35 | 3 | 2 | 2 | 4 | 3 | 2 | 16 |
| 34 | 1 | 5 | 1 | 4 | 3 | 3 | 17 |
| 33 | 1 | 3 | 3 | 3 | 2 | 3 | 15 |
| 32 | 1 | 4 | 3 | 1 | 0 | 5 | 14 |
| 31 | 4 | 5 | 9 | 7 | 3 | 1 | 29 |
| 30 | 2 | 5 | 6 | 3 | 2 | 2 | 20 |
| 29 | 3 | 3 | 2 | 3 | 0 | 4 | 15 |
| 28 | 7 | 3 | 5 | 5 | 4 | 1 | 25 |
| 27 | 4 | 2 | 4 | 6 | 2 | 3 | 21 |
| 26 | 4 | 1 | 2 | 5 | 2 | 2 | 16 |
| 25 | 0 | 4 | 3 | 3 | 2 | 3 | 15 |
| 24 | 1 | 3 | 2 | 2 | 4 | 2 | 14 |
| 23 | 2 | 3 | 0 | 1 | 0 | 3 | 9 |
| 22 | 2 | 2 | 2 | 2 | 1 | 2 | 11 |
| 21 | 1 | 0 | 1 | 3 | 2 | 0 | 7 |
| 20 | 0 | 1 | 1 | 0 | 1 | 0 | 3 |
| 19 | 0 | 1 | 1 | 0 | 1 | 1 | 4 |
| 18 | 0 | 0 | 1 | 1 | 2 | 0 | 4 |
| 17 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| 16 | 0 | | 1 | 0 | 0 | | 1 |
| 15 | 0 | | | 0 | 0 | | 0 |
| 14 | 2 | | | 1 | 0 | | 3 |
| 13 | | | | | 0 | | 0 |
| 12 | | | | | 1 | | 1 |
| Number | 45 | 52 | 52 | 57 | 42 | 51 | 299 |
| Average | 29.2 | 29.1 | 28.6 | 28.7 | 28.8 | 30.8 | 29.2 |
| Median | 28.4 | 29.9 | 29.7 | 28.4 | 28.3 | 31.6 | 29.4 |
| Std. Deviation | 5.90 | 5.04 | 4.79 | 5.23 | 6.82 | 6.03 | 5.62 |
| Reliability (KR-20) | 0.82 | 0.75 | 0.71 | 0.75 | 0.87 | 0.84 | 0.79 |

TABLE 3

NUTRITION KNOWLEDGE TEST SCORE DISTRIBUTION
FOR PRIVATE SCHOOL ELEMENTARY TEACHERS

| SCORE | FREQUENCY |
|---|---|
| 38 | 1 |
| 37 | 1 |
| 36 | 2 |
| 35 | 4 |
| 34 | 3 |
| 33 | 0 |
| 32 | 2 |
| 31 | 11 |
| 30 | 5 |
| 29 | 4 |
| 28 | 1 |
| 27 | 5 |
| 26 | 5 |
| 25 | 5 |
| 24 | 3 |
| 23 | 2 |
| 22 | 3 |
| 21 | 2 |
| 20 | 1 |
| 19 | 1 |
| 18 | 0 |
| 17 | 1 |
| 16 | 1 |
| 15 | 1 |
| Number | 64 |
| Average | 28.0 |
| Median | 28.8 |
| Std. Deviation | 5.23 |
| Reliability (KR-20) | 0.75 |

28.0 for private school elementary teachers. The fact that the averages and the medians (the point that divides the score distribution into two equal parts) for each region and each type of respondent are similar suggests both that the test has desirable measuring qualities and that the sampling design worked well.

The respondents were asked a number of background questions, and several of them provided information that could be used to estimate the validity of the nutrition knowledge test. Food Service managers were asked if they were registered dietitians, and the score distributions of those answering yes were compared to those answering no. The following table summarizes the results.

| | Registered Dietitian | Not a R. D. | No Response |
|---|---|---|---|
| Average Score ($\overline{X}$) | 35.9 | 29.2 | 26.2 |
| Std. Deviation | 6.43 | 5.31 | 5.40 |
| Number | 14 | 257 | 28 |

Registered dietitians scored 6.7 points higher on the average than those indicating they were not RDs, and 9.7 points above those not responding to this background question. Despite the small number of registered dietitians, their average score is higher by a statistically signficant amount ($p < .05$).

Another background question asked of the food service managers yielded additional evidence of test validity. They were asked the number of college level nutrition courses they had taken. The test score distributions for those responding none, one, and two or more were compared, with the following results.

NUMBER OF COLLEGE-LEVEL NUTRITION COURSES TAKEN BY F.S. MANAGERS

| | None | One | Two or More | No Response |
|---|---|---|---|---|
| Average Score ($\bar{X}$) | 28.4 | 32.3 | 34.2 | 26.0 |
| Std. Deviation | 5.11 | 5.57 | 4.84 | 5.07 |
| Number | 206 | 14 | 46 | 33 |

These results show that, when compared to food service managers having taken no college food nutrition courses, those having taken one course scored an average of 3.9 points higher, and those having taken two or more courses scored 5.8 points higher. This positive relationship is statistically significant ($p < .05$).

Overall, these data show a good relationship between predictors of nutrition knowledge and nutrition knowledge test scores.

Two of the background questions asked food service managers showed no significant evidence regarding the validity of the test. These were the number of DPI sponsored summer short courses on nutrition they had attended, and the number of Wisconsin School Food Service Association nutrition workshops attended. The results for these two questions are presented below.

NUMBER OF DPI SUMMER SHORT COURSES ON NUTRITION ATTENDED IN THE PAST FIVE YEARS BY FOOD SERVICE MANAGERS

| | None | One | Two or More | No Response |
|---|---|---|---|---|
| Average Score ($\bar{X}$) | 29.3 | 29.2 | 29.9 | 26.5 |
| Std. Deviation | 5.65 | 6.08 | 5.00 | 5.55 |
| Number | 108 | 75 | 87 | 29 |

NUMBER OF WISCONSIN SCHOOL FOOD SERVICE ASSOCIATION NUTRITION WORKSHOPS ATTENDED IN THE PAST FIVE YEARS BY FOOD SERVICE MANAGERS

| | None | One | Two or More | No Response |
|---|---|---|---|---|
| Average Score ($\bar{X}$) | 30.2 | 28.4 | 29.8 | 25.9 |
| Std. Deviation | 6.87 | 5.30 | 4.74 | 5.29 |
| Number | 73 | 68 | 128 | 30 |

The above two tables show that the knowledge test scores of food service managers are unrelated to attendance at either DPI summer short courses or at W.S.F.S.A. nutrition workshops. This is not too surprising, because the conceptual model on which the test was based is different from the typical content of such short courses or workshops.

The relationship between teacher test scores and various background information was similarly examined to provide evidence of concurrent validity for the nutrition knowledge test. The patterns for public school and private school elementary teachers were very similar; for clarity, only the results for public school teachers are presented.

It was anticipated that teachers having taken one or more college-level nutrition courses would score higher on the test. Such a relationship would provide additional evidence of concurrent validity. Score distributions for those teachers reporting having taken none, one, and two or more college-level nutrition courses were tabulated with the following results.

NUMBER OF COLLEGE-LEVEL NUTRITION COURSES TAKEN BY ELEMENTARY TEACHERS

| | None | One | Two or More | No Response |
|---|---|---|---|---|
| Average Score ($\bar{X}$) | 29.1 | 30.2 | 30.4 | 27.4 |
| Std. Deviation | 4.41 | 4.14 | 4.25 | 5.77 |
| Number | 324 | 81 | 10 | 25 |

Although there is a tendency for elementary teachers who took one or more college level nutrition courses to score about one point higher on the test, the relationship is not significant. Even though a significant relationship between number of nutrition courses taken and test scores was found when this test was pilot tested with college students, it appears that this relationship is not nearly so strong for teachers who are several years removed from such college courses. Another possibility is that the elementary teachers were considering "college-level nutrition courses" to be those which actually included only a small amount of nutrition content, such as a growth and development or a biology course.

Teachers were asked how many years they had been teaching, and how many inservices in nutrition they had attended. The relationships between these background characteristics and test scores are shown below.

NUMBER OF YEARS TEACHING REPORTED BY PUBLIC SCHOOL ELEMENTARY TEACHERS

| | First | 2-5 Years | 6-10 Years | More Than 10 years | No Response |
|---|---|---|---|---|---|
| Average Score ($\bar{X}$) | 29.6 | 29.7 | 29.4 | 29.1 | 24.6 |
| Std. Deviation | 3.25 | 4.74 | 4.41 | 4.35 | 4.52 |
| Number | 8 | 81 | 108 | 233 | 11 |

NUMBER OF INSERVICES ON NUTRITION ATTENDED BY PUBLIC SCHOOL ELEMENTARY TEACHERS

| | None | One or More Within The Last Five Years | None Within The Last Five Years, One or More Before Then | No Response |
|---|---|---|---|---|
| Average Score ($\bar{X}$) | 29.1 | 30.6 | 27.2* | 24.6 |
| Std. Deviation | 4.51 | 3.62 | 5.28 | 4.52 |
| Number | 326 | 89 | 15 | 11 |

*This average is significantly lower ($p < .05$) than those for the other two responses.

It was interesting to note that there was no relationship between test scores and the number of years teaching, and no significant relationship between test scores and teachers' attendance at inservices in nutrition within the past five years. (The writer has no explanation for the lower scores of teachers who had only attended workshops prior to five years ago.) It appears that this nutrition knowledge test does not measure the types of information covered in typical teacher inservices in nutrition. This is not surprising, because the test was constructed to measure information relevant to the NET program's model of informed food choice.

Nutrition knowledge test scores were also considered in relation to the respondents opinions regarding the adequacy of their knowledge. Teachers responded to the following item.

Item: "I do not have sufficient knowledge to teach nutrition to my students."

| Response: | Average Scores (N's in parentheses) for: Public School Elem. Teachers | | Private School Elem. Teachers | |
|---|---|---|---|---|
| Strongly agree | 26.0 | (46) | 26.9 | (13) |
| Agree | 28.2 | (117) | 26.4 | (25) |
| Neutral | 28.6 | (63) | 26.8 | (4) |
| Disagree | 30.5 | (196) | 30.4 | (18) |
| Strongly disagree | 32.2 | (19) | 31.5 | (4) |
| No response | - | (0) | - | (0) |

The relationship between the respondents' perception of the adequacy of their knowledge and their actual test scores is similar for both groups. Those who disagreed with the item (indicating they thought that they had sufficient knowledge) scored significantly higher ($p < .05$) on the nutrition knowledge test than those who agreed. This relationship was stronger for public school teachers than it was for private school teachers.

The relationship between food service managers' perceptions of the adequacy of their knowledge and their test scores were similarly determined with the following item:

Item: "I do not have sufficient knowledge to teach nutrition to students".

| Response | Food Service Managers | |
|---|---|---|
| | Average Score | Number |
| Strongly agree | 26.7 | 43 |
| Agree | 28.0 | 115 |
| Neutral | 28.6 | 44 |
| Disagree | 31.1 | 70 |
| Strongly disagree | 34.9 | 25 |
| No response | 30.5 | 2 |

There is a strong positive relationship between the food service managers' knowledge test scores and their perceptions of the adequacy of their knowledge. Those who disagreed with the item scored significantly higher ($p < .05$) than those who agreed.

The psychometric characteristics of this test were examined by calculating reliability coefficients and performing item analyses for each subgroup of interest. As was presented at the bottom of Tables 1, 2 and 3, the reliability coefficients for this test (using the Kuder-Richardson Formula 20 calculation method) ranged from 0.67 to 0.79. These differences in reliability estimates are partially a reflection of the different range or variability of scores among the groups -- the greater the variability, the higher the reliability estimate.

Test reliability is a measure of the homogeneity or "sameness" of the items in the test. These estimates are lower than would be expected for a typical achievement test of 42 items, because this test is composed of items measuring different aspects of a postulated "informed food choice" model, and these aspects are conceptually different from each other. Such heterogeneity of test items tends to reduce test reliability.

The standard error of measurement estimates for this test were 2.56, 2.59 and 2.60 for food service managers, public school elementary teachers and private school teachers respectively. These values are nearly identical. (Conceptually, this statistic means that if we could test the same persons over and over again without their knowledge levels changing, two out of three times their test scores would not vary more than 2.6 points from their "true" knowledge levels.)

Item analyses were performed to determine how well each item functioned as a measure of nutrition knowledge. When an item analysis is performed, the completed tests are arranged by total score from high to low, and are divided into groups. For example, the 441 usable tests from public school elementary teachers were arranged into five groups, with 79 in the top group with scores ranging from 34 to 40, 100 in the next group with scores ranging from 31 to 33, and so forth. For each item, the number of people in each of these five groups choosing each item option were recorded and analyzed. The results of

these item analyses for public school elementary teachers, food service managers and private school elementary teachers are summarized in Appendix G. Table 4 displays the details of one such analysis.

In Table 4, the item analysis of the responses of public school elementary teachers to item number 1 is interpreted as follows. Response (option) D was the correct answer to this item, and 63 percent chose that option. This is often called the index of difficulty. Proportionately, more teachers in the higher fifths of the score distribution chose option D than teachers in the lower (4th and Bottom) fifths. This is reflected in the point-biserial correlation coefficient of 0.21 which indicates a modest positive correlation between the proportion of teachers in each fifth choosing the option and the total score. The point-biserial correlations are negative for the incorrect options, which is as it should be. One expects people who don't know much about nutrition to choose the incorrect options, and those with more knowledge not to choose incorrect options. Both of the item statistics described above are within the acceptable ranges.

Table 5 summarizes the difficulty indices (proportions of respondents answering the item correctly) on the 42 items for food service managers and public school elementary teachers. (Although the item statistics for the private school teachers were similar to those for the public school teachers, they are not included because the relatively small number of respondents limits the generalizability of the individual item indices.) The median item difficulty index is about 0.70 for both food service managers and public school elementary teachers. Ideally, the difficulty indices for the test items should all be within the range 0.30 to 0.70. For the teachers, nineteen of these indices were above this range and two were below. For food service managers, twenty of these indices were above this range and one was below. These figures indicate that a good number of the items were too "easy" for the respondents. Because of the importance of the performance objectives these "easy" items were measuring, they were retained in the test.

TABLE 4

ITEM ANALYSIS MATRIX SHOWING RESPONSES TO ITEM OPTIONS
BY PUBLIC SCHOOL ELEMENTARY TEACHERS IN EACH FIFTH OF TEST SCORE DISTRIBUTION

Question 1. Which of the following groups list only nutrients?

a. meat, protein, calcium
b. milk, cheese, eggs
c. yeast, sodium, thiamin
d. protein, fat, iron

| Fifth of Score Distribution | Test Item Option | | | | | No. in Fifth |
|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | |
| Top | 1 | 8 | 10 | 60 | 0 | 79 |
| Second | 0 | 17 | 14 | 69 | 0 | 100 |
| Third | 6 | 15 | 9 | 47 | 0 | 77 |
| Fourth | 3 | 20 | 12 | 60 | 0 | 95 |
| Bottom | 12 | 15 | 22 | 41 | 0 | 90 |
| Prop. Selecting Option | 0.05 | 0.17 | 0.15 | 0.63 | 0.00 | 441 |
| Pt.-Bis. Correl. | -0.23 | -0.05 | -0.09 | 0.21 | 0.00 | |

*Correct option

TABLE 5

DISTRIBUTIONS OF ITEM DIFFICULTY INDICES FROM NET NUTRITION KNOWLEDGE TEST FOR FOOD SERVICE MANAGERS AND PUBLIC SCHOOL ELEMENTARY TEACHERS

| DIFFICULTY INDEX RANGE | NUMBER OF TEST ITEMS IN EACH DIFFICULTY RANGE | |
|---|---|---|
| | Food Service Managers | Public School Elementary Teachers |
| .96 - 1.00 | 3 | 3 |
| .91 - .95 | 5 | 7 |
| .86 - .90 | 6 | 4 |
| .81 - .85 | 0 | 2 |
| .76 - .80 | 2 | 3 |
| .71 - .75 | 4 | 2 |
| .66 - .70 | 6 | 4 |
| .61 - .65 | 3 | 3 |
| .56 - .60 | 3 | 4 |
| .51 - .55 | 4 | 3 |
| .46 - .50 | 1 | 1 |
| .41 - .45 | 1 | 1 |
| .36 - .40 | 0 | 2 |
| .31 - .35 | 1 | 1 |
| .26 - .30 | 2 | 0 |
| .21 - .25 | 0 | 2 |
| .16 - .20 | 1 | 0 |
| .15 or less | 0 | 0 |
| Median Index | 0.70 | 0.70 |
| Average Index | 0.69 | 0.70 |

Table 6 summarizes the findings for the point-biserial correlation coefficients for the 42 test items. (The point-biserial correlation coefficient for an item represents the extent to which answering the item correctly is related to having high total scores. For example, if all of the respondents with high scores answered the item correctly, and all of those with low scores missed the item, the correlation would be very close to 1.0. If an equal number of low-scoring and high-scoring respondents answered the item correctly, the correlation would be about 0.00.) For food service managers, the median point-biserial correlation was 0.32, and for public school elementary teachers, the median correlation was 0.25. Overall, many of these item-total score correlation coefficients are lower than the minimum value of 0.30 which is desirable from a classical test construction point of view. This is particularly true for the results from the elementary teachers.

The large number of items with low point-biserial correlation coefficients is due both to the intended heterogeneity of test-item content, and to the relatively low difficulty of many of the items. While this finding is disappointing when viewed from a classical test-construction perspective, it is not a serious flaw.

Because the tests given to the two groups were identical, any differences in item indices must be attributed to differences between the two groups (the kinds of nutrition knowledge each possesses, the approach they use to answering items about which they have only partial knowledge, etc.). No satisfactory explanation for the differences is presently available.

Overall, the reliability estimate and item statistics show the Wisconsin NET nutrition knowledge test to have adequate floor and ceiling to measure the varying levels of nutrition knowledge statewide, and to be adequate for reliably detecting differences between groups. However, it does not have sufficient reliability to be used for making firm decisions about differences between individuals unless the differences in their scores are greater than five or six points. Empirical evidence for the test's validity is strong for food service managers and moderate for elementary teachers.

TABLE 6

DISTRIBUTIONS OF POINT-BISERIAL CORRELATION COEFFICIENTS FROM NET NUTRITION KNOWLEDGE TEST FOR FOOD SERVICE MANAGERS AND PUBLIC SCHOOL ELEMENTARY TEACHERS

| CORRELATION COEFFICIENT RANGE | NUMBER OF TEST ITEMS IN EACH CORRELATION COEFFICIENT RANGE | |
|---|---|---|
| | Food Service Managers | Public School Elementary Teachers |
| 0.56 or more | 0 | 0 |
| .51 - .55 | 1 | 0 |
| .46 - .50 | 2 | 1 |
| .41 - .45 | 7 | 2 |
| .36 - .40 | 4 | 5 |
| .31 - .35 | 9 | 3 |
| .26 - .30 | 7 | 10 |
| .21 - .25 | 6 | 9 |
| .16 - .20 | 4 | 5 |
| .11 - .15 | 1 | 5 |
| .06 - .10 | 1 | 1 |
| .00 - .05 | 0 | 1 |
| Median Correlation | 0.32 | 0.25 |
| Average Correlation | 0.32 | 0.26 |

## SECTION THREE

## OPINIONS REGARDING TOPICS RELATED TO NUTRITION EDUCATION

As part of the statewide study of the level of nutrition-related knowledge which was conducted in the spring of 1980 by the Wisconsin NET program, public school food service managers and public and private school elementary teachers responded to opinion items regarding various topics related to nutrition education. Because of the differing roles of food service managers and teachers, many of the items for the two groups differed. The appropriate opinion items were appended to the knowledge tests which were distributed to each group. (Private school and public school teachers responded to the same items.)

Some of the items measured attitudes that could influence nutrition education efforts in general. For example, both teachers and food service managers indicated their agreement or disagreement with the statement "Good eating habits are important to good health." None of the respondents were neutral or disagreed with this statement, in fact 83 percent of the teachers and food service managers strongly agreed. These responses indicate a positive viewpoint which is important to nutrition education.

### Effects of Nutrition Instruction

Opinions regarding the efficacy of efforts to improve students' food habits by increasing their level of nutrition knowledge were assessed using the following item:

Item: "Increased nutrition knowledge will lead to improved food habits, values and attitudes."

| Response | Public School Elem. Teachers | Private School Elem. Teachers | Food Service Managers |
|---|---|---|---|
| Strongly agree | 42% | 31% | 50% |
| Agree | 52 | 59 | 43 |
| No opinion | 2 | 3 | 3 |
| Disagree | 3 | 6 | 3 |
| Strongly disagree | a | 0 | 0 |
| No response | 0 | 0 | a |
| | 100% | 99% | 100% |
| No. of respondents | (441) | (64) | (300) |

Note: Percentages may not total 100% due to rounding, a = less than 1/2%

According to these figures, almost all of the teachers and food service managers believe that increasing nutrition knowledge will affect food habits. Such positive attitudes are important to nutrition education.

Opinions regarding the effect of teaching nutrition in the classroom were obtained with the following item. (The wording for food service managers is shown in parentheses.)

Item: "I (teachers) can improve student nutrition knowledge by teaching nutrition in the classroom."

| Response | Public School Elem. Teachers | Private School Elem. Teachers | Food Service Managers |
|---|---|---|---|
| Strongly agree | 37% | 37% | 54% |
| Agree | 57 | 58 | 44 |
| No opinion | 3 | 3 | 1 |
| Disagree | 2 | 2 | 1 |
| Strongly disagree | a | 0 | 0 |
| No response | 0 | 0 | a |
| | 100% | 100% | 100% |
| No. of respondents | (441) | (64) | (300) |

a = less than 1/2%

The vast majority of both teachers and food service managers are very positive about the improvement that can be made by teaching nutrition in the classroom. Such attitudes should assist nutrition education activities in the schools.

Teachers (but not food service managers) responded to an additional item regarding the effects teaching about nutrition would have on student food habits.

Item: "It is impossible to change food habits by teaching nutrition in the classroom."

| Response | Public School Elem. Teachers | Private School Elem. Teachers |
|---|---|---|
| Strongly agree | 2% | 3% |
| Agree | 10 | 9 |
| No opinion | 8 | 9 |
| Disagree | 70 | 67 |
| Strongly disagree | 10 | 11 |
| No response | 0 | 0 |
| | 100% | 99% |
| No. of respondents | (441) | (64) |

Note: Percentages may not total 100% due to rounding.

These responses show that the vast majority of public and private elementary school teachers believe that student food habits can be changed by teaching nutrition.

The same information was sought in another way from both teachers and food service managers. In this case, only those teachers whose schools had a lunch room responded. (Note that this eliminated 31 percent of the private school teachers and 7 percent of the public school teachers.)

After responding to an item regarding nutrition education activities in classrooms and lunchrooms, both groups responded to the following item:

Item: "Teaching nutrition in either or both locations will NOT improve student food habits."

| Response | Elem. Teachers (only those who indicated their school had a lunchroom) | | Food Service Managers |
|---|---|---|---|
| | Public | Private | |
| Strongly agree | 1% | 0% | 2% |
| Agree | 7 | 11 | 9 |
| No opinion | 13 | 14 | 6 |
| Disagree | 68 | 68 | 64 |
| Strongly disagree | 12 | 7 | 19 |
| No response | 0 | 0 | a |
| | 101% | 100% | 100% |
| No. of respondents | (411) | (44) | (300) |

Note: Percentages may not total 100% due to rounding.
a = less than 1/2%

To further probe their opinions regarding the efficacy of attempting to change student food habits, both teachers in schools with lunchrooms and food service managers responded to an item regarding the best location, classroom or lunchroom, "for activities designed to improve student food habits". One possible response was:

> "Neither location--nothing can be done in either location to change food habits."

In schools having lunchrooms, only 3 percent of the public school teachers and 7 percent of the private school teachers chose this pessimistic option. Only 4 percent of the food service managers selected this response.

Overall, a clear pattern of opinion on this topic emerges. The vast majority (75 to 80 percent) of both teachers and food service managers believe that both student nutrition knowledge and food habits can be improved by means of nutrition education.

## Philosophy and Approaches Regarding Nutrition Education

Several of the opinion items dealt with teaching philosophy and approaches regarding nutrition education. These items covered the most effective location or combination of locations for conducting nutrition education activities, teaching nutrition as a separate unit versus incorporating nutrition knowledge into the ongoing curriculum, and coordination of nutrition education among teachers, food service managers, and parents.

The legislation enacting nutrition education stipulates that both the classroom and the lunchroom should be sites for such activities. The wording of the third choice of the following item closely reflected the wording of the legislation, and it was gratifying to see the support of the respondents for this choice.

Item: "The most effective location for teaching nutrition knowledge to students is:"

| Response | Elem. Teachers (only those who indicated their school had a lunchroom) Public | Private | Food Service Managers |
|---|---|---|---|
| (a) Classroom | 19% | 11% | 8% |
| (b) Lunchroom | a | 0 | 1 |
| (c) Classroom with the lunchroom as a learning laboratory | 56 | 61 | 59 |
| (d) Either location-both can be equally effective | 24 | 25 | 32 |
| No Response | a | 2 | a |
| | 100% | 99% | 100% |
| No. of respondents | (411) | (44) | (300) |

Note: Percentages may not total 100% due to rounding,
a = less than 1/2%

The second item concerned with location was similar in wording to the previous item. The only difference was that the focus was on change in student food habits rather than on change in knowledge.

Item: "The most effective location for activities designed to improve student food habits is:"

| Response | Elem. Teachers (only those who indicated their school had a lunchroom) Public | Private | Food Service Managers |
|---|---|---|---|
| (a) Classroom | 11% | 4% | 5% |
| (b) Lunchroom | 2 | 4 | 5 |
| (c) Classroom with the lunchroom as a learning laboratory | 61 | 55 | 59 |
| (d) Either location--both can be equally effective | 23 | 30 | 27 |
| (e) Neither location--nothing can be done in either location to change food habits | 3 | 7 | 4 |
| No Response | a | 0 | a |
| | 100% | 100% | 100% |
| No. of respondents | (411) | (44) | (300) |

a = less than 1/2%

The response pattern is very similar to the previous item, with the majority of the respondents supporting activities in the classroom with the lunchroom used as a learning laboratory. Seven percent or less of the respondents were pessimistic about the influence of such activities on student food habits.

Teachers and food service managers both responded to items regarding cooperation with various groups in nutrition education. Food service managers' opinions regarding such cooperation with both parents and teachers were very positive, as their responses below indicate:

Item: "It is important to coordinate my [food service manager] nutrition efforts with . . ."

| | Coordination with: | |
|---|---|---|
| Response | Parents | Teachers |
| Strongly agree | 15% | 18% |
| Agree | 49 | 52 |
| No opinion | 24 | 21 |
| Disagree | 10 | 7 |
| Strongly disagree | a | a |
| No response | 1 | 1 |
| | 100% | 100% |

a = less than 1/2%

The responses of public and private elementary school teachers to the items regarding the importance of cooperation were similar enough that only those of the public school teachers will be displayed. The responses of public school elementary teachers were as follows:

Item: "It is important to coordinate my nutrition education efforts with . . ."

| | Coordination with: | |
|---|---|---|
| Response | Parents | Food Service Personnel* |
| Strongly agree | 24% | 7% |
| Agree | 59 | 40 |
| No opinion | 14 | 29 |
| Disagree | 3 | 22 |
| Strongly disagree | 0 | 2 |
| No response | 0 | a |
| | 100% | 100% |

*Only teachers from schools with lunch programs responded.
a = less than 1/2%

Although teachers, like food service managers, believe it is important to coordinate nutrition education with parents, they do not share the same opinion regarding reciprocal coordination with food service managers. Seventy percent of the food service managers agreed that it was important to coordinate nutrition education efforts with teachers, whereas only 47 percent of the teachers agreed that it was important to coordinate such efforts with food service personnel.

The philosophic thrust of the Wisconsin NET program is to encourage the incorporation of nutrition information, as appropriate, into the major ongoing curriculum areas such as science, social studies, health, and so forth. The typical alternative to this approach is to teach nutrition as a separate unit in the curriculum, which would require allocating instructional time to nutrition which was formerly used for the other subjects. Because it is a common saying among educators that we only know how to add to the curriculum, and not how to subtract things from it, the Wisconsin NET program wanted to avoid having nutrition compete for time as a separate unit.

Good educational arguments can be made for either teaching nutrition as a separate unit or for incorporating it into other areas of the curriculum. To assess teacher opinion on this topic, they were asked the following item.

Item: "It is more effective to teach nutrition as a separate unit rather than integrating it into other disciplines such as life sciences or social sciences."

| Response | Public School Elem. Teachers | Private School Elem. Teachers |
|---|---|---|
| Strongly agree | 8% | 5% |
| Agree | 31 | 31 |
| No opinion | 16 | 19 |
| Disagree | 40 | 39 |
| Strongly disagree | 5 | 6 |
| No response | 0 | 0 |
| | 100% | 100% |
| No. of respondents | (441) | (64) |

These responses show that teacher support for the two viewpoints is nearly equally divided, with 39 percent of the public school teachers favoring the separate unit approach and 45 percent in agreement with the integration into other disciplines approach. The corresponding percentages of private school teachers were 36 percent and 45 percent, respectively, indicating that both groups of teachers hold very similar views. If those chosing "no opinion" are eliminated from consideration, the majority of those expressing an opinion favored incorporating nutrition into the other disciplines.

Two opinion items dealt with the amount of materials and resources available to teachers and food service managers, and the amount of time available to them for nutrition education activities.

The first item, dealing with materials and inservice availability, was intended to assist in needs identification. Its wording, and the responses of teachers and food service managers were as follows:

Item: (Teachers) "I have adequate materials, inservice programs, and resources to help me teach nutrition."

(Food Service Managers) ". . . to help me use the cafeteria as a learning laboratory."

| Response | Public School Elem. Teachers | Private School Elem. Teachers | Food Service Managers |
|---|---|---|---|
| Strongly agree | 5% | 0% | 2% |
| Agree | 32 | 20 | 22 |
| No opinion | 9 | 11 | 20 |
| Disagree | 41 | 53 | 49 |
| Strongly disagree | 12 | 16 | 6 |
| No response | 0 | 0 | a |
| | 99% | 100% | 100% |
| No. of respondents | (441) | (64) | (300) |

Note: Percentages may not total 100% due to rounding error.
a = less than 1/2%

Note that the majority of each group disagreed with the statement, indicating they believe that they do <u>not</u> have adequate materials, inservice programs, etc., for them to teach nutrition. Private school teachers appear to have the

fewest resources available. (The differences between the responses of the public and private school teachers are statistically significant at the .05 level.)

The amount of time teachers and food service managers had available for nutrition education activities was ascertained with the second item, which follows.

Item: "I have enough time or flexibility in my schedule to be active in nutrition education."

| Response | Public School Elem. Teachers | Private School Elem. Teachers | Food Service Managers |
|---|---|---|---|
| Strongly agree | 4% | 2% | 1% |
| Agree | 36 | 36 | 15 |
| No opinion | 12 | 12 | 10 |
| Disagree | 38 | 38 | 51 |
| Strongly disagree | 8 | 11 | 22 |
| No response | 2 | 2 | 1 |
| | 100% | 101% | 100% |
| No. of respondents | (441) | (64) | (300) |

Note: Percentages may not total 100% due to rounding.

The responses of public and private school teachers are very similar -- 38 to 40 percent of them have enough time or flexibility. Far fewer food service managers have enough time -- only 16 percent agreed that they had enough time or flexibility to be active in nutrition education. (This difference is statistically significant at the .05 level.)

To obtain an estimate of how much nutrition education elementary school students received, teachers responded to the following item.

Item: "Approximately how many hours of nutrition education did each student taught by you receive during the last year?"

| Response | Public School Elem. Teachers | Private School Elem. Teachers |
|---|---|---|
| None | 12% | 31% |
| 1 - 2 hours | 21 | 30 |
| 3 - 5 hours | 31 | 20 |
| 6 - 10 hours | 24 | 9 |
| More than 10 hours | 11 | 8 |
| No response | 1 | 2 |
| | 100% | 100% |
| No. of respondents | (441) | (64) |

These figures show a definite, statistically significant difference between the amount of nutrition education received by public and private school elementary students. The typical (median) number of hours of nutrition education in public schools was between three and five hours, whereas the typical amount was one to two hours in private schools. A far larger percentage of private school students received no nutrition education: 31 percent of the private school teachers reported no nutrition education occurred last year, whereas 12 percent of the public school teachers reported no instruction.

It is possible that this difference in the amount of nutrition education occurring in the two types of schools may be due to curriculum differences and to the amount of materials and other resources available, rather than to differences in the availability of time. Both groups of teachers had reported very similar amounts of time available, but only 20 percent of the private school teachers reported they had "adequate materials, inservice programs and resources" for teaching nutrition, whereas 37 percent of the public school teachers reported such resources were adequate.

Food service managers responded to a similar item but, due to ambiguities subsequently found in its wording, the responses were judged not valid and are not reported.

## Perceptions of Nutrition Knowledge

To provide information to assist in the validation of the knowledge test, both teachers and food service managers were asked to rate how much they thought they knew about nutrition.

Item: "I do not have sufficient knowledge to teach nutrition to (my) students."

| Response | Public School Elem. Teachers | Private School Elem. Teachers | Food Service Managers |
|---|---|---|---|
| Strongly agree | 10% | 20% | 14% |
| Agree | 27 | 39 | 38 |
| No opinion | 14 | 6 | 15 |
| Disagree | 44 | 28 | 23 |
| Strongly disagree | 4 | 6 | 8 |
| No response | 0 | 0 | 1 |
| | 99% | 99% | 99% |
| No. of respondents | (441) | (64) | (300) |

Note: Percentages may not total 100% due to rounding.

Although the difference is not statistically significant, more public school teachers disagreed with this statement than did either private school teachers or food service managers, suggesting that a larger percentage of them are confident of the adequacy of their knowledge. The average nutrition knowledge test scores for the three groups were: 29.2, 28.0, and 29.2 for public school teachers, private school teachers, and food service managers respectively. The difference of 1.2 points for the private school teachers approaches statistical significance, and quite possibly represents a small, but real, difference. It is quite probable that the respondents were taking into account their knowledge about how to teach nutrition as well as their perceived level of nutrition knowledge, and that this accounts for some of the differences in the responses among the three groups.

As reported earlier, there was a positive relationship between the respondents' perceptions of their level of nutrition knowledge and their knowledge test scores. The details are shown on page 14 of this report.

Because nutrition education in a local school should involve cooperation between teachers and food service workers, it was important to ascertain the perceptions these groups had of each other. Teachers' perceptions of the food service workers in their school were obtained with this item. (Only teachers from schools with lunch programs responded.)

Item: "Food service personnel in my school have sufficient knowledge to teach nutrition to my students."

| Response | Elementary Teachers (from schools with lunch programs) | |
|---|---|---|
| | Public | Private |
| Strongly agree | 3% | 4% |
| Agree | 18 | 16 |
| No opinion | 36 | 39 |
| Disagree | 29 | 39 |
| Strongly disagree | 12 | 2 |
| No response | a | 0 |
| | 100% | 100% |
| No. of respondents | (411) | (44) |

a = less than 1/2%

Note that a large percentage of teachers either had no basis for judging, or were diplomatic and chose the "no opinion" response. Of those expressing an opinion, the majority did not believe that food service personnel in their school had sufficient knowledge to teach nutrition to their students. It should be noted that this is not their appraisal of food service managers, but of the whole staff of food service workers.

The perceptions food service managers have of teachers' nutrition knowledge were assessed with the following item.

Item: "Teachers in my school have sufficient knowledge to teach nutrition to students."

| Response | Food Service Managers |
|---|---|
| Strongly agree | 6% |
| Agree | 39 |
| No opinion | 31 |
| Disagree | 22 |
| Strongly disagree | 2 |
| No response | a |
| | 100% |
| No. of respondents | (300) |

a = less than 1/2%

A large percentage of the food service managers chose the "no opinion" response, similar to the way teachers responded on the previously discussed item. However, the majority of those expressing an opinion had a favorable assessment of the knowledge level of their school's teachers. Such opinions, combined with the finding reported earlier that 70 percent of the food service managers believe it important to coordinate nutrition education efforts with teachers, provide support for cooperative efforts. However, the perceptions of food service managers regarding teacher views of them must still be considered. These were assessed with the following item for food service managers.

Item: "Teachers view me as a knowledgeable partner in nutrition education."

| Response | Food Service Managers |
|---|---|
| Strongly agree | 5% |
| Agree | 30 |
| No opinion | 48 |
| Disagree | 11 |
| Strongly disagree | 5 |
| No response | 2 |
| | 101% |
| No. of respondents | 300 |

Note: percentages do not total 100% due to rounding

Note that nearly one-half of the food service managers did not express an opinion on this topic. Also, 16 percent had the perception that they were not viewed as a knowledgeable partner in nutrition education by teachers. Thus, communication and cooperation will have to be fostered between these two groups in a majority of the schools if the NET program objectives of cooperative nutrition education activities and using the lunchroom as a learning laboratory are to be achieved. As regards this last activity, it is occurring in about half of the schools having lunchrooms, as is shown by the responses to the following item.

Lunchroom as a Learning Laboratory

Item: "How many times during the last year did you use the lunchroom as a learning laboratory?"

| Response | Food Service Managers |
|---|---|
| None | 51% |
| 1 - 2 times | 20 |
| 3 - 5 times | 14 |
| 6 - 10 times | 6 |
| More than 10 times | 7 |
| No response | 2 |
| | 100% |
| No. of respondents | (300) |

a = less than 1/2%

In 27 percent of the schools, such activities occurred at least three times, which is probably frequently enough to have an effect. Although it is encouraging to see this high a level of an educational use of the lunchroom, there is still much room for improvement.

Another factor linked to nutrition and nutrition education is the quality of the lunch program and its utilization by students. Slightly under 500,000 students participate in the school lunch program in Wisconsin schools. This is about 46 percent of the number who could participate. Teachers in schools with lunch programs were asked to rate its quality.

Item: "My school has a high quality lunch program (good food, pleasant atmosphere)."

| Response | Elementary Teachers (from schools with lunch programs) | |
|---|---|---|
| | Public | Private |
| Strongly agree | 12% | 18% |
| Agree | 52 | 57 |
| No opinion | 10 | 7 |
| Disagree | 22 | 11 |
| Strongly disagree | 4 | 7 |
| No response | a | 0 |
| | 100% | 100% |
| No. of respondents | (411) | (44) |

a = less than 1/2%

It is encouraging to note that a clear majority of the teachers judged their school's lunch program to be of high quality. The 26% of the public school teachers who did not consider their school's lunch program to be of high quality represent a continuing concern not just of the NET program, but of the whole School Food and Nutrition Services Section within the Wisconsin Department of Public Instruction, which has as part of its mission assisting schools to have high quality lunch programs.

The last opinion item regarding the lunch program was the following.

Item: "Students should be encouraged to eat more school lunch."

| Response | Food Service Managers |
|---|---|
| Strongly agree | 61% |
| Agree | 35 |
| No opinion | 2 |
| Disagree | 1 |
| Strongly disagree | 0 |
| No response | 1 |
| | 100% |
| No. of respondents | (300) |

a = less than 1/2%

Unfortunately, the ambiguity of the wording of this item was not noticed until after the survey was sent out. This item was intended to refer to student participation in the school lunch program, and not to their consuming more. It is hoped that the interpretations of the food service managers were such that their responses indicate strong generalized support for the school lunch program.

Summary of Findings

The vast majority (75 to 80 percent) of teachers and food service managers believe that both student nutrition knowledge and their food habits can be improved by means of nutrition education activities in the classroom.

Slightly more than one-half of the teachers and food service managers believe that the most effective locations for nutrition education activities are the classroom with the lunchroom as a learning laboratory.

The majority of teachers and food service managers were supportive of the coordination of nutrition education with parents. A majority of food service managers also endorsed such coordination with teachers, but less than half of the teachers supported such coordination with food service managers.

Teacher opinion is nearly evenly divided between teaching nutrition as a separate unit and integrating it into other disciplines (such as life science or social science), with slightly more public and private school teachers favoring integrating nutrition into the other disciplines. About 17 percent of the teachers did not express a preference.

A majority of both teachers and food service managers indicated they did not have adequate materials, inservice programs, and resources to help them teach nutrition. Private school teachers appear to be the worst off in this regard, with 69 percent of them reporting this problem.

The availability of time and schedule flexibility to permit nutrition education activity is much more of a problem for food service managers than for teachers. Seventy-three percent of them reported this problem, whereas 46

percent of the public and 49 percent of the private school teachers reported insufficient time and flexibility.

Public school students are more likely to receive nutrition education instruction than are private school students. According to teacher responses, the typical amount of nutrition education experienced by public school students was between three and five hours, with 35 percent receiving six or more hours a year. For private school students the typical amount of such instruction was between one and two hours, while only 17 percent received six or more hours a year.

Forty-eight percent of the public school teachers were confident that they had sufficient knowledge to teach nutrition. The percentages of confident private school teachers and food service managers were smaller: 34 percent and 33 percent respectively.

Food service managers' perceptions of the nutrition knowledge level of teachers in their schools were similar to the teachers' self-assessments; 45 percent of them judged the teachers as having adequate knowledge to teach nutrition, while 48 percent of the teachers so rated themselves. Because of the relatively large proportion of food service managers who expressed no opinion, this is a clear majority (nearly two to one) of those who expressed an opinion.

Teachers were generally not as positive about the knowledge levels of the food service personnel in their schools. Forty-one percent of both the public and the private school teachers did not believe these workers had sufficient knowledge to teach nutrition to students. Because of the large percentage of teachers who did not express an opinion, this is a clear majority (over two to one) of those who expressed an opinion.

Thirty-five percent of food service managers did not believe that teachers viewed them as knowledgeable partners in nutrition education. This is over two times the percentage who consider themselves viewed as knowledgeable partners. Nearly half (48 percent) of the food service managers did not express an opinion on this subject.

Fifty-one percent of the food service managers reported that they did not use the lunchroom in their schools as a learning laboratory. Of the 47 percent who reported using the lunchroom as a learning laboratory, about four-tenths of them had used it once or twice, three-tenths had used it three to five times, and three-tenths had used it six or more times in this manner.

Slightly less than half of the students (about 46 percent) attending school participate in the school lunch program. (This is a little less than 500,000 students daily.) The typical lunch program in Wisconsin is of high quality, according to the teachers' responses. Sixty-four percent of the public and 75 percent of the private school teachers in schools with lunch programs judged their school's lunch program to be of high quality. Almost all of the food service managers expressed the opinion that students should be encouraged to eat school lunches.

## Discussion

Elementary teachers in both public and private schools and public school food service managers hold opinions which are supportive of the principles associated with nutrition education. They endorse the concept that good eating habits are important to good health. They also are strong believers in the efficacy of nutrition education in improving both students' knowledge and their food habits.

Teachers and food service managers endorse using both the classroom and the lunchroom as sites for nutrition education activities. The majority of each group favored activities in the classroom with the lunchroom used as a learning laboratory. Such attitudes should facilitate implementing the intent of the federal legislation authorizing the NET program, which stipulates that both sites should be used, and that the lunchroom should be a learning laboratory. However, in over half of the schools having lunch programs, the lunchroom is not being used as a learning laboratory, and in only one-fourth of the schools are such activities occurring at least three times in a year. Thus, there is much room for improvement in this area.

The NET legislation also specifies that nutrition education activities should include the parents, and that they should involve cooperative efforts between the food service staff and the teachers. The principle of including parents in nutrition education activities was endorsed by a majority of both teachers and food service managers. A majority of food service managers also endorsed the principle of coordination of nutrition education efforts with teachers. However, teachers were less enthusiastic about coordination of their nutrition education efforts with food service personnel; nearly one-third were non-committal about such coordination and only slightly less than half would agree with such coordination. This indicates that special efforts will have to be made to encourage teachers to work cooperatively with food service personnel, and to increase the nutrition education abilities of food service personnel to prepare them better to assume this role.

Teachers' coordination and cooperation with food service personnel are also probably inhibited by the perceptions teachers have of the levels of knowledge of food service personnel, and by their perceptions of a partnership relationship with food service managers. Only about one-fifth of the teachers believe food service staff have sufficient knowledge to teach nutrition to students, and only about one-third of the food service managers reported that teachers viewed them as a knowledgeable partner in nutrition education, although both scored comparably well on the nutrition knowledge test. These findings suggest that the NET program should make special efforts to break down any existing barriers between teachers and food service personnel and to encourage cooperative nutrition education activities.

Another thrust in the legislation authorizing the NET program is the provision of scientifically accurate materials and information to schools and teachers. There is evidence of need for materials on the part of food service managers and teachers, especially those in private schools, as over half of the food service managers and public school teachers reported not having adequate materials, inservice programs and resources, and over two-thirds of the private school teachers reported the same. Thus, the program's efforts to locate and provide good materials, and develop inservice materials are addressing a genuine need, which is recognized by a majority of the potential beneficiaries of these efforts.

The Wisconsin NET program has chosen to encourage the incorporation of nutrition information and concepts into the ongoing curriculum. The opinions of Wisconsin teachers regarding the best means of including nutrition education in the curriculum are nearly evenly divided between two different approaches. A significant fraction did not express an opinion, but of those expressing an opinion, a slight majority favored integrating nutrition into the other disciplines, and a very strong minority favored teaching nutrition as a separate unit. Because good educational arguments can be made for both viewpoints, the Wisconsin NET program will have to accommodate both of them, as well as encourage the undecided teachers to integrate nutrition into the ongoing curriculum, rather than to try to find space for it as a separate entity in an already overcrowded schedule.

The survey revealed that more nutrition education was occurring in public than in private schools. The typical number of hours of nutrition education experienced by public school students was between three and five hours, with about one-third of the students receiving six or more hours a year. In private schools, the typical number of hours of such instruction was between one and two, and a little less than one-fifth of the students received six or more hours a year. The difference in the amount of nutrition education occurring in public and private schools may be attributable to differences in curriculum, the availability of materials and resources, and/or the teachers' confidence in the adequacy of their knowledge regarding this topic.

The lunchroom has great potential for reaching a large number of students. Slightly under 500,000 students participate in the school lunch program in Wisconsin in a typical day. This is about 46 percent of the students attending school on a typical day. Clear majorities of both public and private school teachers rate the quality of their school's lunch program as high, and food service managers were nearly unanimous in agreeing that students should be encouraged to participate in the school lunch program. Thus, the overall environment appears conducive to high participation. However, only slightly less than half of the schools with lunch programs are also using the lunchroom as a learning laboratory. If the typically high quality of the lunch program is continued and the lunchroom is also a site for cooperative nutrition education experiences, a large number of students will be reached.

## APPENDIX A

### General Behavioral Objectives and Performance Objectives describing the Informed Food Choice Model

Key: GBO: General Behavioral Objective
PO: Performance Objective
TSWBAT: The student will be able to

GBO 1 EXPLAIN WHY WE NEED FOOD

PO 1.1 Given questions about why we need food, TSWBAT identify, by circling, responses which indicate that we need food for energy, growth, maintenance and repair.

GBO 2 LIST THE FUNCTIONS OF THE MAJOR CLASSES OF NUTRIENTS
EXPLAIN WHAT A NUTRIENT IS

PO 2.1 Given lists of several groups of substances (either foods or nutrients) TSWBAT distinguish those groups which contain both foods and nutrients from those groups which contain only nutrients by circling the groups which contain only nutrients.

PO 2.2 Given the name of a nutrient which is said to be deficient in an individual's diet, TSWBAT identify the deficiency disease associated with such a deficiency by circling the correct response.

NOTE: deficiencies present in U.S. populations should be emphasized. e.g.: iron - anemia.

PO 2.3 Given a list of statements, TSWBAT identify, by circling, those which describe functions of nutrients.

GBO 3 CLASSIFY FOOD SOURCES OF THE MAJOR NUTRIENTS

PO 3.1 Given the name of a nutrient and a list of foods, TSWBAT identify the food(s) in which the nutrient is found by circling the correct response.

GBO 4 ESTIMATE NUTRIENT REQUIREMENTS WITHIN A GENERAL RANGE FOR SELF AND THOSE INDIVIDUALS FOR WHOSE DIETS HE OR SHE IS RESPONSIBLE

PO 4.1 Given a description of several different quantities of a nutrient source (food) TSWBAT identify by circling, the amount of the food(s) that most closely represents his or her daily requirement for that nutrient (or the requirement for a child, elderly person, or other individual for whom she or he may be responsible).

GBO 5 EXPLAIN WHAT A CALORIE IS AND HOW IT RELATES TO ENERGY

PO 5.1 Given a a list of definitions, TSWBAT identify, by circling, the correct definition of a Calorie.

PO 5.2 Given a choice of different Caloric values per gram of carbohydrate, protein and fat, TSWBAT identify, by circling, responses which indicate that fat has a little over twice the calories found in protein and carbohydrate.

PO 5.3 Given a list of nutrients, TSWBAT distinguish those which provide energy from those which do not by circling the energy supplying nutrients. (this may include alcohol as a source of calories)

PO 5.4 Given questions concerning Caloric balance, TSWBAT recognize that excess energy, whether consumed as fat, carbohydrate, or protein, will be stored in the body as fat.

PO 5.5 Given a list of factors, TSWBAT distinguish those which have an influence on energy requirement from those which do not by circling those which influence energy requirements.

GBO 6 SELECT A DIET CONTAINING THE AMOUNTS OF NUTRIENTS HE OR SHE REQUIRES WITHIN HIS OR HER ENERGY NEEDS

PO 6.1 Given a common food which is of low nutrient density and a list of alternate foods, TSWBAT substitute the more nutrient dense food present in the list by circling it.

PO 6.2 Given a description of a diet or a meal, TSWBAT evaluate its adequacy by using a daily food guide.

GBO 7 EXPLAIN THE RELATIONSHIP OF NUTRIENT AND ENERGY REQUIREMENTS TO PHYSICAL, PSYCHOLOGICAL AND ENVIRONMENTAL STRESSES

PO 7.1 Given descriptions of individuals in varying physical, psychological, and/or environmental stresses, TSWBAT identify the nutrient(s) most affected by circling them. Examples of stress may include: pregnancy, lactation, growth, aging, climate, anorexia, smoking, and alcohol.

GBO 8 SUBSTITUTE NUTRITIONALLY EQUIVALENT FOODS FOR FOODS WHICH ARE UNACCEPTABLE, UNAVAILABLE, OR TOO EXPENSIVE

PO 8.1 Given the name of a common food which is said to be unacceptable, unavailable, or too expensive, TSWBAT substitute a nutritionally equivalent food by circling this food from a list of alternates.

PO 8.2 Given labels of several different foods and the label from a common food which is said to be unavailable, unacceptable, or too expensive, TSWBAT choose a nutritionally equivalent food or choose the most economical of the nutritionally equivalent foods by circling them.

PO 8.3 Given ingredient lists of several different forms of the same food (e.g. cereals or fruit juices/drinks) TSWBAT identify the most prominent ingredient by circling it.

GBO 9 IDENTIFY RESOURCES FOR RELIABLE NUTRITION INFORMATION
DISTINGUISH PERTINENT NUTRITION INFORMATION FOUND IN AVAILABLE SOURCES

PO 9.1 Given a list of resources including professionals, other individuals, print and electronic media, TSWBAT identify those resources which are the most reliable sources of nutrition information by circling them.

PO 9.2 Given a statement dealing with nutrition, TSWBAT distinguish pertinent nutrition information from other unfounded or irrelevent information by judging whether several statements based upon the statement are true or false.

PO 9.3 Given a list of books and pamphlets, TSWBAT identify daily food guides as useful resources for information on nutrient sources by circling them.

GBO 10 EVALUATE ONE'S OWN DIET USING FACTS ABOUT NUTRIENT REQUIREMENTS, FUNCTIONS, SOURCES, AND HEALTH INMPLICATIONS

EVALUATE NUTRITION INFORMATION AND ALTERNATE DIETS USING FACTS ABOUT NUTRIENT REQUIREMENTS, FUNCTIONS, SOURCES, AND HEALTH IMPLICATIONS

PO 10.1 Given a description of one day's diet which is described as a typical or usual diet for an individual, TSWBAT evaluate the adequacy of the diet by circling the nutrients which are low (or in excess) in the diet and/or circling the food sources which may be added (or restricted) in order to improve the overall quality of the diet. (Diets which are nutritionally adequate may also be used.)

PO 10.2 Given a description of a popular reducing diet, TSWBAT evaluate . . . (same as above) also for diets representing other cultures . . .

GBO 11 ANALYZE WHY HE OR SHE CHOOSES CERTAIN FOODS OVER OTHERS INCLUDING "TRADE-OFFS" (i.e. WHAT ADJUSTMENTS OF INTAKE MAY BE MADE IN ORDER TO ACCOMMODATE THE INCLUSION OF CERTAIN FOODS)

ANALYZE THE RELATIVE BENEFITS AND RISKS OF HIS OR HER FOOD CHOICE

PO 11.1 The student will be given a description of an individual's food intake for breakfast, lunch, and snacks. The student will then be asked questions concerning what food choices would be best for the rest of the day as well as the acceptability of the snack food choices. TSWBAT differentiate between judging the quality of an individual food and judging the quality of the overall diet.

PO 11.2 Given descriptions of situations in which an individual must make a food choice, TSWBAT identify the possible benefits or risks involved in making that decision and will identify them by circling. (May include effects of alcohol consumption.)

GBO 12 DESCRIBE HOW HIS OR HER FOOD CHOICES MAY AFFECT HIS OR HER STATE OF HEALTH AND/OR FEELING OF WELL BEING

PO 12.1 Given questions about the effects of excess sugar consumption, TSWBAT identify dental caries as a possible consequence.

PO 12.2 Given questions about the effects of consumption of excess Calories, TSWBAT identify obesity as a consequence.

PO 12.3 TSWBAT identify adverse effects of obesity on an individual's sense of well being by circling these adverse effects.

GBO 13 BE ABLE TO CONSTRUCT A NUTRITIONALLY ADEQUATE DIET FROM THE AVAILABLE FOOD SUPPLY WITHIN A SPECIFIED BUDGET FOR SELF AND THE INDIVIDUALS FOR WHOSE DIETS SHE OR HE IS RESPONSIBLE

*(This GBO cannot be directly tested)*

GBO 14 LIST SEVERAL WAYS IN WHICH FOOD INFLUENCES SOCIAL INTERACTIONS*

PO 14.1 Given descriptions of social interactions in which food and/or alcohol are a part, TSWBAT identify the hidden messages which are being transmitted and/or the basic assumptions behind the association of certain foods with certain situations.

GBO 15 REPORT WHICH AESTHETIC AND SENSORY QUALITIES INFLUENCE THE SELECTION OF DIFFERENT FOODS BY DIFFERENT INDIVIDUALS*

PO 15.1 Given a list of different reasons why individuals reject or select a food, TSWBAT identify by circling, those which involve the aesthetic and sensory qualities of the food.

GBO 16 IDENTIFY THOSE SITUATIONS IN WHICH FOOD IS USED AS AN OBJECT OF EXPRESSIVE BEHAVIOR*

PO 16.1 Given a description of various situations in which food is a part, TSWBAT identify, by circling, those situations in which food is used as an object of expressive behavior.

GBO 17 DESCRIBE HOW CULTURAL, SOCIAL, ECONOMIC, AND PSYCHOLOGICAL FACTORS INFLUENCE FOOD INTAKE AND CHOICE

PO 17.1 Given examples of food advertisements, TSWBAT identify by circling the psychological factors which are used to sell the product.

PO 17.2 Given descriptions of individuals who are consuming various diets, TSWBAT identify by circling, any cultural, social economic or psychological factors which have influenced the individual's food choice.

GBO 18 IDENTIFY THE WAYS THAT INHABITANTS OF THIS PLANET ARE INTER-DEPENDENT ON FINITE RESOURCES THAT INCLUDE FOOD*

PO 18.1 Given a list of different forms of protein, TSWBAT identify, by circling, the form which uses the least food resources to produce.

PO 18.2 Given statements concerning malnutrition, TSWBAT distinguish common myths from facts by circling the myths.

PO 18.3 Given a plant source of protein and a list of other plant proteins, TSWBAT identify which food items may be used to complement the protein in order to improve protein quality.

GBO 19 ENUMERATE THE FOOD DISTRIBUTION FACTORS THAT INFLUENCE THE NUTRITIONAL QUALITIES OF THE DIET OF A POPULATION

PO 19.1 Given a list of various factors said to influence the nutritional qualities of the diet of a population, TSWBAT identify by circling, those that are related to food distribution (e.g. transportation, refrigeration).

PO 19.2 Given a list of various factors said to influence the nutritional quality of the diet of a population if advanced technology did not exist, TSWBAT identify by circling, the natural factors (e.g. climate, geography, population size).

GBO 20 DEMONSTRATE HOW BEST TO SELECT, PREPARE AND STORE FOODS IN ORDER TO OBTAIN OPTIMUM NUTRITIONAL VALUE

LIST SOME OF THE ADVANTAGES AND DISADVANTAGES ASSOCIATED WITH PROPER AND IMPROPER FOOD HANDLING AND PROCESSING

IDENTIFY MAJOR FACTORS THAT AFFECT COST, QUALITY, AVAILABILITY, AND VARIETY OF FOODS IN THE MARKETPLACE*

PO 20.1 Given a list of nutrients and a list of conditions (light, heat, oxygen, water) TSWBAT identify the factors to which each nutrient is susceptable.

PO 20.2 Given a list of foods prepared in different ways, TSWBAT identify the food which has retained the most nutrients by circling it.

PO 20.3 Given a list of statements which are characteristics of food processing, TSWBAT classify those which are advantages and those which are disadvantages.

PO 20.4 Given a description of food handling practices, TSWBAT identify by circling, those which may cause food contamination or spoilage.

PO 20.5 Given a description of changes in the quality, availability, or market price of an item over different seasons, or in different forms of the same item, TSWBAT identify by circling, the major factors affecting the changes in these variables.

GBO 22 IDENTIFY THOSE CONDITIONS FOR WHICH A DIET-DISEASE LINK HAS BEEN DETERMINED

PO 22.1 Given a list of diet-disease links, TSWBAT identify, by circling, the link which is most certain.

GBO 21 IDENTIFY THE BIOLOGICAL PROCESSES INVOLVED IN MAKING NUTRIENTS AVAILABLE TO THE BODY*

PO 21.1 Given descriptions of various biological processes, TSWBAT identify by circling, those which describe digestion, absorption, and metabolism.

*"Program Objectives for Learners", nutrition in a changing world The School Nutrition Education Curriculum Study Pennsylvania State University 1978

## APPENDIX B

### Wisconsin NET Nutrition Knowledge Test - Level 2, Form B

Instructions: Questions 1-42 have only one correct answer. Choose the correct answer and fill in the appropriate circle on your answer sheet.

1. Which of the following groups list *ONLY* nutrients?
   a. meat, protein, calcium
   b. milk, cheese, eggs
   c. yeast, sodium, thiamin
   d. protein, fat, iron

2. Which of the following is *NOT* a nutrient function?
   a. regulation of body processes
   b. supply of energy
   c. lubrication of body joints
   d. aid in night vision

3. Which of the following is generally the *BEST* source of Vitamin A?
   a. cottage cheese
   b. fruits and vegetables
   c. grains
   d. poultry and fish

4. Which of the following is a good source of iron?
   a. beef
   b. cantaloupe
   c. milk
   d. popcorn

5. If a typical adult needed to satisfy but not exceed his/her Recommended Dietary Allowances (RDA) for Vitamin C from one food source, she/he could consume:
   a. one tablespoon of grapefruit juice
   b. one cup of grapefruit juice
   c. one quart of grapefruit juice

6. A kilocalorie (Calorie) is a measure of:
   a. the amount of heat required to digest the food we eat.
   b. the energy value of food.
   c. food quality.
   d. the amount of fat gained from overeating.

7. Which of the following groups contain only nutrients which *DO NOT* provide Calories?
   a. vitamins, minerals, water
   b. protein, minerals, water
   c. fat, vitamins, carbohydrate
   d. carbohydrate, proteins, fat

8. Which of the following statements is true?
   a. Even if you are on a weight reduction diet, it doesn't matter how much protein you eat since protein doesn't have any Calories.
   b. Eating half of a grapefruit after each meal will help you burn away excess Calories.
   c. Energy intake in excess of an individual's requirement is stored in the body as fat.
   d. Most obese individuals have glandular abnormalities.

9. Which of the following contains the most Calories per gram?
   a. vitamins
   b. protein
   c. carbohyrate
   d. fat

10. Karen is trying to lose weight, but is concerned that she eat the proper amounts of all the nutrients she requires. Which food would provide the most vitamins and minerals in the fewest Calories?
   a. jello
   b. banana bread
   c. cantaloupe

11. Which of the following meals contains foods from each of the basic four food groups?
   a. chicken, broccoli, rice, milk
   b. spaghetti, meat sauce, bread, butter, tea
   c. hamburger, bun, fries, coke
   d. spinach salad with tomatoes and carrots, oil and vinegar, melba toast, milk

12. Who is *LEAST* likely to be at risk for iron deficiency?
   a. infants and growing children
   b. pregnant and lactating women
   c. an 18 year old woman
   d. a post menopausal woman

13. Which of the following is true about pregnancy?
   a. The only nutrient requirement which is increased during pregnancy is iron.
   b. Pregnant women should gain between 25 and 30 pounds during pregnancy.
   c. Pregnant women need not worry about increasing nutrient intake: the fetus will take what it needs anyway.
   d. Pregnant women who are obese should restrict Caloric intake so that they don't gain any weight.

14. Individuals who do not get any sunlight may be at risk for a deficiency of which nutrient?
   a. vitamin $B_{12}$
   b. vitamin C
   c. vitamin D
   d. folic acid

15. Jane is tired of serving orange juice as a source of Vitamin C. Which of the following would be the best substitute?

## ORANGE JUICE

**NUTRITION INFORMATION**
(per serving)
**Serving size = ½ cup**
**Servings per container = 8**

| | |
|---|---|
| CALORIES | 80 |
| PROTEIN | 1 gm |
| CARBOHYDRATE | 13 gm |
| FAT | 0 gm |

**PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)**

| | | | |
|---|---|---|---|
| PROTEIN | 0 | RIBOFLAVIN ($B_2$) | 0 |
| VITAMIN A | 4 | NIACIN | 2 |
| VITAMIN C | 90 | CALCIUM | 0 |
| THIAMINE ($B_1$) | 6 | IRON | 0 |

A.

## PRUNE JUICE

**NUTRITION INFORMATION**
(per serving)
**Serving size = ½ cup**
**Servings per container = 2**

| | |
|---|---|
| CALORIES | 100 |
| PROTEIN | 1 gm |
| CARBOHYDRATE | 24 gm |
| FAT | 0 gm |

**PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)**

| | | | |
|---|---|---|---|
| PROTEIN | * | RIBOFLAVIN ($B_2$) | * |
| VITAMIN A | * | NIACIN | 3 |
| VITAMIN C | 4 | CALCIUM | 2 |
| THIAMINE ($B_1$) | * | IRON | 5 |

*CONTAINS LESS THAN 2% OF THE U.S. RDA OF THESE NUTRIENTS

B.

## STRAWBERRIES

**NUTRITION INFORMATION**
(per serving)
**Serving Size = ½ cup**
**Servings per container = 4**

| | |
|---|---|
| CALORIES | 45 |
| PROTEIN | 0 gm |
| CARBOHYDRATE | 7 gm |
| FAT | 0 gm |

**PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)**

| | | | |
|---|---|---|---|
| PROTEIN | 0 | RIBOFLAVIN ($B_2$) | 3 |
| VITAMIN A | * | NIACIN | 3 |
| VITAMIN C | 73 | CALCIUM | 2 |
| THIAMINE ($B_1$) | * | IRON | 4 |

*CONTAINS LESS THAN 2% OF THE U.S. RDA OF THESE NUTRIENTS

C.

## APPLE JUICE

**NUTRITION INFORMATION**
(per serving)
**Serving size = ½ cup**
**Servings per container = 8**

| | |
|---|---|
| CALORIES | 60 |
| PROTEIN | 0 gm |
| CARBOHYDRATE | 15 gm |
| FAT | 0 gm |

**PERCENTAGE OF U.S. RECOMMENED DAILY ALLOWANCES (U.S. RDA)**

| | | | |
|---|---|---|---|
| PROTEIN | 0 | RIBOFLAVIN ($B_2$) | * |
| VITAMIN A | 0 | NIACIN | * |
| VITAMIN C | * | CALCIUM | * |
| THIAMINE ($B_1$) | * | IRON | 4 |

*CONTAINS LESS THAN2% OF THE U.S. RDA OF THESE NUTRIENTS

16. Which of the following cereal products contains proportionately the *MOST* sugar?

a. Ingredients: Whole Wheat, Rolled Oats, BHT

b. Ingredients: Whole Wheat, Brown Sugar, Coconut Oil, Raisins, Honey, Sesame Seeds, Cinnamon, Salt, and Soy Lecithin

c. Ingredients: Wheat Bran, Milled Yellow Corn, Sugar, Malt, Salt, Coconut Oil, Sodium Ascorbate (Vitamin C) Niacinamide, Reduced Iron, Pyridoxine Hydrochloride (Vitamin $B_6$) Thiamine Mononitrate (Vitamin $B_1$), BHA (a preservative), Folic Acid and Vitamin $B_{12}$

d. Ingredients: Sugar, Wheat, Corn Syrup, Partially Hydrogenated Soybean Oil, Honey, Salt, Caramel Coloring, Sodium Acetate, Sodium Ascorbate (Vitamin C), Vitamin A Palmitate, Niacinamide, Reduced Iron, Lecithin, Pyridoxine Hydrochloride (Vitamin $B_6$), Riboflavin (Vitamin $B_2$), Thiamine Hydrochloride (Vitamin $B_1$), Folic Acid and Vitamin $D_2$

17. The following is a diet eaten by a boy in the 6th grade:

| | |
|---|---|
| Breakfast: | 1 cup corn grits |
| | 1 Tbsp. sugar |
| | 1 cup milk |
| | ½ cup orange juice |
| Lunch: | 1 - 2" square cornbread |
| | 1 cup pork and beans |
| | 1 cup milk |
| | ½ cup collard greens |
| Dinner: | 2 halves candied yams |
| | 3½ oz. fried pork chop |
| | 1 cup milk |
| | ½ cup peas |
| | ½ cup fruited jello |
| Snacks: | ½ cup custard |
| | 1 pear |
| | 2 oatmeal raisin cookies |
| | 1 banana |

This diet is:
a. inadequate - low in protein
b. inadequate - low in vitamin A
c. inadequate - low in calcium
d. nutritionally adequate

18. John loves citrus fruit, but because of a truckers' strike, he can't find any in the supermarket. Which of the following locally grown foods would be the closest *nutritional* equivalent?
   a. apple cider
   b. broccoli
   c. carrots
   d. grapes

19. Debbie dislikes carrots. What food would be the best substitute if she wanted to be sure to get the nutrients contained in carrots?
   a. apples
   b. grapes
   c. spinach
   d. celery

*Questions 20 - 22 concern the following diet:*

Michael is 28 and has been a lacto-ovo vegetarian for 4 years. The following is a typical day's diet:

Breakfast: Whole wheat bread with honey
oatmeal and raisins
milk

Lunch: Peanut butter sandwiches (2)
apple juice
granola bar

Dinner: Rice and bean casserole
Whole wheat bread with butter
herb tea

Snacks: Morning: yogurt
Afternoon: graham crackers with milk

20. This diet is low in:
   a. protein
   b. carbohydrate
   c. calcium
   d. vitamin A

21. If Michael has been eating a diet similar to this one since he became a vegetarian, he might be at risk for a deficiency of which nutrient?
   a. vitamin C
   b. thiamin
   c. vitamin $B_{12}$
   d. protein

22. To improve this diet, Michael should add:
   a. brewers' yeast
   b. poultry or fish
   c. vegetables or fruit

*Questions 23 and 24 concern the following diet:*

Nancy is 5'9" tall, on the track team of her high school, and practices daily. So far today, she has eaten:

Breakfast: orange juice, 2 eggs, home fries, 2 slices toast, 2% milk

Lunch: macaroni and cheese, broccoli, 2% milk

Snacks: cheese Danish
carrot cake with cream cheese frosting, 2% milk

23. Which of the following is true about Nancy's diet?
   a. Nancy's diet is probably appropriate for her age and activity level.
   b. Nancy should cut down on her cholesterol intake since she is probably at risk.
   c. Nancy should cut down on her calories: she's probably gaining weight.
   d. Nancy should increase her protein intake since she's in training.

24. Nancy's choice of snacks is:
   a. okay as long as she maintains her activity level.
   b. unwise since they provide excess calories.
   c. unwise because it will ruin her appetite.

25. Which of the following is *MOST* closely associated with sugar consumption?
   a. dental caries
   b. heart disease
   c. obesity

26. Obesity is associated with increased risk for all of the following *EXCEPT*:
   a. hypertension
   b. gallstones
   c. ulcers
   d. diabetes

27. Andy is 2 years old and refuses to eat his spinach. His mother tells Andy that if he eats some spinach, he can have dessert. Andy immediately eats some spinach. What has happened?
   a. Andy has learned to like spinach.
   b. Andy's mother has found an appropriate way to get Andy to eat his spinach.
   c. Andy has learned that desserts are fattening.
   d. Andy has learned that by refusing to eat vegetables he can get something he loves to eat.

28. An example of the way in which the sensory qualities of a food may affect its consumption is:
   a. Bill eats whole grains because they are nutritious.
   b. Joan decides to buy some ice cream because it soothes her sore throat.
   c. Lynn eats raisins because they are high in iron.
   d. Tony takes a sandwich with him because he can't afford to buy lunch.

29. It's Jamie's birthday and her mom has spent the day preparing Jamie's favorite dinner. This is an example of:
   a. using food as a means of expressing feelings.
   b. the effect of culture on food choice.
   c. using food as a nutrient source.

30. "Parents who care use Pal" (Breakfast Cereal). Which of the following is being used to sell Pal?
   a. The nutritional content of Pal compared to other brands.
   b. The psychological desire to be a good parent.
   c. The economical consideration: Pal is cheaper than other brands.
   d. The taste factor: Pal tastes better than other brands.

31. A severe deficiency of iron will result in which condition?
   a. anemia
   b. beri beri
   c. pellagra
   d. scurvy

32. Which of the following is the *BEST* example of protein complementation?
   a. eating bacon and eggs
   b. eating beans and rice
   c. eating peas and carrots
   d. eating nuts and raisins

33. To improve the protein quality of bread, it could be eaten with:
   a. butter
   b. gelatin
   c. peanut butter

34. Which of the following sources of protein requires the *LEAST* food resources to produce?
   a. beans
   b. beef
   c. eggs
   d. poultry

35. Not long ago, fresh oranges and grapefruit were delicacies in Wisconsin. Today, they are available year round. This is a result of:
   a. widespread use of preservatives.
   b. increased marketability in the north.
   c. improved transportation systems.
   d. increased awareness of the importance of vitamin C on the part of Northerners.

36. Which of the following nutrients is most susceptible to losses in *water*?
   a. vitamin A
   b. vitamin D
   c. vitamin $B_6$
   d. vitamin E

37. Food contamination may result from:
   a. mixing milk and citrus fruits.
   b. simmering foods uncovered on a stove.
   c. using baking soda when cooking vegetables.
   d. using the same cutting board for raw poultry and vegetables.

38. An example of a benefit-risk relationship is:
   a. Sodium nitrate prevents the growth of dangerous spores in meat, but may also be carcinogenic.
   b. Artificial food colors increase the marketability of food by making it more acceptable.
   c. White flour has most of the nutrients removed during processing, but a few are then added back.
   d. Fresh fruit is available out of season when shipped from other markets but may taste sweeter.

39. Which of the following nutrients is most susceptible to destruction by exposure to *oxygen*?
   a. vitamin C
   b. vitamin D
   c. protein
   d. magnesium

40. Which of these is most certain?
   a. Too much cholesterol causes atherosclerosis.
   b. Not enough vitamin C causes colds.
   c. Too many calories cause obesity.
   d. Too much coffee causes hypertension.

41. In order to be absorbed, what must happen to proteins?
   a. They must be broken down to amino acids.
   b. They must be converted to glucose.
   c. They must be attached to vitamin C.
   d. Nothing - they are absorbed as eaten.

42. The primary function of digestion is:
   a. to separate nutrients from enzymes.
   b. to break down food into a simple form so that it can be absorbed into the body.
   c. to break down food to the point where bacteria may act on it.
   d. to eliminate toxic chemicals from the body by means of defecation.

## APPENDIX C: Food Service Manager Opinion Items

**Items 43-59 have no right or wrong answer. Choose the response that most closely represents your feelings about the statement.**

43. Good eating habits are important to good health.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

44. Increased nutrition knowledge will lead to improved food habits, values and attitudes.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

45. Teachers can improve student nutrition knowledge by teaching nutrition in the classroom.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

46. The most effective location for teaching nutrition knowledge to students is:

a. the classroom
b. the lunchroom
c. the classroom with the lunchroom as a learning laboratory
d. either location - both can be equally effective

47. Teaching nutrition in either or both of these locations will NOT improve student food habits.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

48. The most effective location for activities designed to improve student food habits is:

a. the classroom
b. the lunchroom
c. the classroom with the lunchroom as a learning laboratory.
d. either location-both can be equally effective
e. neither location-nothing can be done in either location to change food habits

49. I do not have sufficient knowledge to teach nutrition to students.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

50. Teachers in my school have sufficient knowledge to teach nutrition to students.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

51. I have adequate materials, inservice programs and resources to help me use the cafeteria as a learning laboratory.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

52. I have enough time or flexibility in my schedule to be active in nutrition education.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

53. It is important to coordinate my nutrition education efforts with parents.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

54. It is important to coordinate my nutrition education efforts with teachers.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

55. Students should be encouraged to eat school lunch.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

56. It is important that students participate in planning school lunch programs.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

57. Approximately how many hours of nutrition-related classroom instruction did you participate in during the last year?

a. none
b. 1-2 hours
c. 3-5 hours
d. 6-10 hours
e. more than 10 hours

58. How many times during the last year did you use the lunch room as a learning laboratory?

a. none
b. 1-2 times
c. 3-5 times
d. 6-10 times
e. more than 10 times

59. The teachers view me as a knowledgeable partner in nutrition education.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

## APPENDIX D: Teacher Opinion Items

Items 43-60 have no right or wrong answer. Choose the response that most closely represents your feelings about the statement.

43. Good eating habits are important to good health.

a. stongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

44. Increased nutrition knowledge will lead to improved food habits, values and attitudes:

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

45. I can improve student nutrition knowledge by teaching nutrition in the classroom.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

46. I do not have sufficient knowledge to teach nutrition to my students.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

47. I have adequate materials, inservice programs and resources to help me teach nutrition.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

48. It is more effective to teach nutrition as a separate unit rather than integrating it into other disciplines such as life sciences or social sciences.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

49. It is impossible to change student food habits by teaching nutrition in the classroom.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

50. Approximately how many hours of nutrition education did each student taught by you receive during the last year?

a. none
b. 1-2 hours
c. 3-5 hours
d. 6-10 hours
e. more than 10 hours

51. It is important to coordinate my nutrition education efforts with parents.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

52. I have enough time or flexibility in my schedule to be active in nutrition education.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

53. Does your school have a school lunch program? If yes, respond to statements 54-60. If no, do NOT respond to these statements.

a. yes
b. no (skip 54-60)

54. Food service personnel in my school have sufficient knowledge to teach nutrition to my students.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

55. It is important to coordinate my nutrition education efforts with food service personnel.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

56. It is important that students participate in planning school lunch programs.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

57. My school has a high quality lunch program (good food, pleasant atmosphere).

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

58. The most effective location for teaching nutrition <u>knowledge</u> to students is:

a. the classroom
b. the lunchroom
c. the classroom with the lunchroom as a learning laboratory.
d. either location-both can be equally effective.

59. Teaching nutrition in either or both of these locations will <u>NOT</u> improve student <u>food habits</u>.

a. strongly agree
b. agree
c. no opinion
d. disagree
e. strongly disagree

60. The most effective location for activities designed to improve student <u>food habits</u> is:

a. the classroom
b. the lunchroom
c. the classroom with the lunchroom as a learning laboratory
d. either location-both can be equally effective
e. neither location-nothing can be done in either location to change food habits.

State of Wisconsin DEPARTMENT OF PUBLIC INSTRUCTION

*Barbara Thompson, Ph.D.*
*State Superintendent*

*Dwight M. Stevens, Ph.D.*
*Deputy State Superintendent*

*DIVISION FOR MANAGEMENT, PLANNING AND FEDERAL SERVICES*
*Archie A. Buchmiller, Ph.D., Assistant Superintendent*

April 16, 1980

Dear Teacher:

As part of a study of nutrition education needs in Wisconsin, the Nutrition Education and Training program is conducting a survey to determine the knowledge Wisconsin elementary teachers and food service managers have about nutrition. As a result of a random selection process, you were chosen as part of a representative statewide sample of elementary teachers.

The enclosed test was designed to cover the broad range of knowledge a person well prepared in nutrition would have. The test should take no longer than 20 to 30 minutes to complete. Because this test is comprehensive it may be difficult for someone who has not received specific training or other exposure to nutrition information.

If the test appears difficult, please complete it anyway. We recognize that it is a natural desire to want to do well on a test. Please respond to the test only on the basis of what you presently know, and do not seek information from anyone else or from any written sources. Just do the best that you can on your own, regardless of how easy or difficult the test appears to you. Your answers will never be identified with you personally.

Answers to the test will be coded by the Wisconsin Survey Research Laboratory, and once in the data file they cannot be linked to individuals or schools. The number in the left-hand corner of the self-addressed, postage paid envelope is so that we will know you have returned the answer sheet and need not be contacted again.

So that you can see how well you did on the test, we will send you an answer key after we have received your completed answer sheet. Ignore the directions on the test and mark your answers on your copy of the test as well as on the answer sheet, so that you can check your answers.

If you have any questions about this study, please call Frank Evans, (608)266-1863, or Mary Jo Tuckwell (608) 266-7475.

Thank you for your cooperation in this study!

Sincerely,

Frank B Evans

Frank B. Evans, Ed.D.
Evaluation Specialist
Nutrition Education and Training Program

63

*126 Langdon Street, Madison, Wisconsin 53702*

State of Wisconsin DEPARTMENT OF PUBLIC INSTRUCTION

*Barbara Thompson, Ph.D.*
*State Superintendent*

*Dwight M. Stevens, Ph.D.*
*Deputy State Superintendent*

*DIVISION FOR MANAGEMENT, PLANNING AND FEDERAL SERVICES*
*Archie A. Buchmiller, Ph.D., Assistant Superintendent*

April 16, 1980

Dear Food Service Manager:

As part of a study of nutrition education needs in Wisconsin, the Nutrition Education and Training program is conducting a survey to determine the knowledge Wisconsin food service managers and elementary teachers have about nutrition. As a result of a random selection process, you were chosen as part of a representative statewide sample of food service managers.

The enclosed test was designed to cover the broad range of knowledge a person well prepared in nutrition would have. The test should take no longer than 20 to 30 minutes to complete. Because this test is comprehensive it may be difficult for someone who has not received specific training or other exposure to nutrition information.

If the test appears difficult, please complete it anyway. We recognize that it is a natural desire to want to do well on a test. Please respond to the test only on the basis of what you presently know, and do not seek information from anyone else or from any written sources. Just do the best that you can on your own, regardless of how easy or difficult the test appears to you. Your answers will never be identified with you personally.

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Thank you for your cooperation in this study!

Sincerely,

Frank B. Evans

Frank B. Evans, Ed.D.
Evaluation Specialist
Nutrition Education and Training Program

*126 Langdon Street, Madison, Wisconsin 53702*

## DIRECTIONS

### Food Service Managers
### Nutrition Knowledge Test Level 2C

Use a black lead pencil. (Pens don't work as well.) Because the answer sheet will be processed with optical scanning equipment, please do not make any stray marks on it. Also, please do not fold or crease the answer sheet.

1. Do not put you name on the answer sheet.

2. Leave the Identification Number blank.

3. Code the Special Codes (letters A through J) with the answers which apply to you, using the following codes:

   A. Size of food service operation:

      0. 1 to 5 person operation
      1. 6 to 10 person operation
      2. larger than 10 persons

   B. Are you a Registered Dietitian?

      0. no
      1. yes

   C. College level nutrition courses taken:

      0. none
      1. one
      2. two or more

   D. D.P.I. Summer Short Courses on nutrition attended in the last 5 years:

      0. none
      1. one
      2. two or more

   E. Wisconsin School Food Service Association nutrition workshops attended in the last five years:

      0. none
      1. one
      2. two or more

   I - J. Code the CESA region for your school. Use a zero before the single digit numbers (for example, 01, 02, 03, ... 09).

4. Answer the test and opinion items, making sure the circles on the answer sheet are filled in completely. (Mark your answers on your test, too, so that you can check them later with the answer key which will be sent you.)

5. Return the answer sheet in the envelope provided. DO NOT FOLD the answer sheet.

THANK YOU FOR YOUR ASSISTANCE IN THIS STUDY!

## DIRECTIONS

### Elementary Teachers
### Nutrition Knowledge Test Level 2B

Use a black lead pencil. (Pens don't work as well.) Because the answer sheet will be processed with optical scanning equipment, please do not make any stray marks on it. Also, please do not fold or crease the answer sheet.

1. Do not put your name on the answer sheet.

2. Leave the Identification Number blank.

3. Code the Special Codes (letters A through J) with the answers which apply to you, using the following codes:

   A. Grade level taught:

      0. non-graded, continuous progress, or similar organization
      1. grade K - 3, self contained classroom
      2. grade 4 - 6, self contained classroom
      3. grade 7 - 8, self contained classroom
      4. grade K - 3, departmentalized
      5. grade 4 - 6, departmentalized
      6. grade 7 - 8, departmentalized

      9. other (please explain on separate page and return with the optical scan answer sheet)

   B. Number of years teaching:

      0. first year
      1. 2 - 5 years
      2. 6 - 10 years
      3. more than 10 years

   C. College level nutrition courses taken:

      0. none
      1. one
      2. two or more

   D. Inservices in nutrition:

      0. none
      1. one or more inservices in nutrition within the past five years
      2. one or more inservices in nutrition more than five years ago, but none in the past five years

   I - J. Code the CESA region for your school. Use a zero before the single digit numbers (for example, 01, 02, 03, ... 09).

4. Answer the test and opinion items, making sure the circles on the answer sheet are filled in completely. (Mark your answers on your test, too, so that you can check them later with the answer key which will be sent you.)

5. Return the answer sheet in the envelope provided. DO NOT FOLD the answer sheet.

THANK YOU FOR YOUR ASSISTANCE IN THIS STUDY!

APPENDIX F: Test Answer Key

State of Wisconsin · DEPARTMENT OF PUBLIC INSTRUCTION

*Barbara Thompson, Ph.D.*
*State Superintendent*

*Dwight M. Stevens, Ph.D.*
*Deputy State Superintendent*

*DIVISION FOR MANAGEMENT, PLANNING AND FEDERAL SERVICES*
*Archie A. Buchmiller, Ph.D., Assistant Superintendent*

Dear Test Participant:

Thank you for returning your answer sheet for the Nutrition Education and Training Program survey. The answers to Forms 2B and 2C of the Nutrition Knowledge Test are listed below.

| | | | |
|---|---|---|---|
| 1. | d | 22. | c |
| 2. | c | 23. | a |
| 3. | b | 24. | a |
| 4. | a | 25. | a |
| 5. | b | 26. | c |
| 6. | b | 27. | d |
| 7. | a | 28. | b |
| 8. | c | 29. | a |
| 9. | d | 30. | b |
| 10. | c | 31. | a |
| 11. | a | 32. | b |
| 12. | d | 33. | c |
| 13. | b | 34. | a |
| 14. | c | 35. | c |
| 15. | b | 36. | c |
| 16. | d | 37. | d |
| 17. | d | 38. | a |
| 18. | b | 39. | a |
| 19. | c | 40. | c |
| 20. | d | 41. | a |
| 21. | a | 42. | b |

Sincerely,

EDWARD J. POST, DIRECTOR
Food and Nutrition Services

Mary Jo Tuckwell

(Mrs.) Mary Jo Tuckwell, R.D., MPH
Nutrition Education Coordinator

MJT:svw



*126 Langdon Street Madison, Wisconsin 53702*

APPENDIX G

ITEM STATISTICS FOR WISCONSIN NET NUTRITION KNOWLEDGE TEST

1. Which of the following groups list *ONLY* nutrients?
   a. meat, protein, calcium
   b. milk, cheese, eggs
   c. yeast, sodium, thiamin
   d. protein, fat, iron

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 8% | 28% | 10% | 52% | 2% | 0.41 | 299 |
| Publ. Sch. El. Teach. | 5 | 17 | 15 | 63 | 0 | 0.21 | 441 |
| Priv. Sch. El. Teach. | 3 | 27 | 20 | 48 | 2 | 0.30 | 64 |

* Indicates Correct Option
a = Less Than ½%

2. Which of the following is *NOT* a nutrient function?
   a. regulation of body processes
   b. supply of energy
   c. lubrication of body joints
   d. aid in night vision

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 15% | 10% | 48% | 25% | 1% | 0.39 | 299 |
| Publ. Sch. El. Teach. | 14 | 5 | 50 | 31 | a | 0.22 | 441 |
| Priv. Sch. El. Teach. | 2 | 11 | 48 | 39 | 0 | 0.30 | 64 |

* Indicates Correct Option
a = Less Than ½%

3. Which of the following is generally the BEST source of Vitamin A?
   a. cottage cheese
   b. fruits and vegetables
   c. grains
   d. poultry and fish

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 6% | 87% | 3% | 4% | a | 0.32 | 299 |
| Publ. Sch. El. Teach. | 10 | 66 | 10 | 13 | a | 0.39 | 441 |
| Priv. Sch. El. Teach. | 19 | 55 | 17 | 9 | 0 | 0.24 | 64 |

* Indicates Correct Option.
a = Less Than ½%

4. Which of the following is a good source of iron?
   a. beef
   b. cantaloupe
   c. milk
   d. popcorn

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 87% | 7% | 5% | 0% | 1% | 0.18 | 299 |
| Publ. Sch. El. Teach. | 76 | 12 | 12 | a | 0 | 0.24 | 441 |
| Priv. Sch. El. Teach. | 75 | 13 | 11 | 2 | 0 | 0.10 | 64 |

* Indicates Correct Option.
a = Less Than ½%

5. If a typical adult needed to satisfy but not exceed his/her Recommended Dietary Allowances (RDA) for Vitamin C from one food source, she/he could consume:
   a. one tablespoon of grapefruit juice
   b. one cup of grapefruit juice
   c. one quart of grapefruit juice

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 7% | 89% | 4% | -- | a | 0.07 | 299 |
| Publ. Sch. El. Teach. | 9 | 84 | 7 | -- | a | 0.15 | 441 |
| Priv. Sch. El. Teach. | 3 | 89 | 8 | -- | 0 | 0.08 | 64 |

* Indicates Correct Option
a = Less Than ½%

6. A kilocalorie (Calorie) is a measure of:
   a. the amount of heat required to digest the food we eat.
   b. the energy value of food.
   c. food quality.
   d. the amount of fat gained from overeating.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 25% | 67% | 1% | 7% | 0% | 0.35 | 299 |
| Publ. Sch. El. Teach. | 42 | 56 | a | 1 | a | 0.13 | 441 |
| Priv. Sch. El. Teach. | 53 | 44 | 0 | 3 | 0 | 0.26 | 64 |

* Indicates Correct Option
a = Less Than ½%

7. Which of the following groups contain only nutrients which *DO NOT* provide Calories?
   a. vitamins, minerals, water
   b. protein, minerals, water
   c. fat, vitamins, carbohydrate
   d. carbohydrate, proteins, fat

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 94% | 4% | 0% | 0% | 1% | 0.25 | 299 |
| Publ. Sch. El. Teach. | 93 | 6 | 0 | a | a | 0.27 | 441 |
| Priv. Sch. El. Teach. | 95 | 3 | 0 | 2 | 0 | 0.38 | 64 |

* Indicates Correct Option
a = Less Than ½%

8. Which of the following statements is true?
   a. Even if you are on a weight reduction diet, it doesn't matter how much protein you eat since protein doesn't have any Calories.
   b. Eating half of a grapefruit after each meal will help you burn away excess Calories.
   c. Energy intake in excess of an individual's requirement is stored in the body as fat.
   d. Most obese individuals have glandular abnormalities.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 2% | 6% | 89% | 1% | 2% | 0.41 | 299 |
| Publ. Sch. El. Teach. | 3 | 4 | 92 | 1 | a | 0.27 | 441 |
| Priv. Sch. El. Teach. | 2 | 5 | 92 | 2 | 0 | 0.29 | 64 |

* Indicates Correct Option
a = Less Than ½%

9. Which of the following contains the most Calories per gram?
   a. vitamins
   b. protein
   c. carbohyrate
   d. fat

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 1% | 5% | 25% | 68% | 1% | 0.37 | 299 |
| Publ. Sch. El. Teach. | a | 4 | 36 | 59 | 1 | 0.30 | 441 |
| Priv. Sch. El. Teach. | 0 | 0 | 38 | 63 | 0 | 0.36 | 64 |

* Indicates Correct Option
a = Less Than ½%

10. Karen is trying to lose weight, but is concerned that she eat the proper amounts of all the nutrients she requires. Which food would provide the most vitamins and minerals in the fewest Calories?
   a. jello
   b. banana bread
   c. cantaloupe

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 6% | 5% | 88% | -- | a | 0.26 | 299 |
| Publ. Sch. El. Teach. | 8 | 5 | 86 | -- | 1 | 0.26 | 441 |
| Priv. Sch. El. Teach. | 14 | 11 | 75 | -- | 0 | 0.34 | 64 |

* Indicates Correct Option
a = Less Than ½%

11. Which of the following meals contains foods from each of the basic four food groups?
   a. chicken, broccoli, rice, milk
   b. spaghetti, meat sauce, bread, butter, tea
   c. hamburger, bun, fries, coke
   d. spinach salad with tomatoes and carrots, oil and vinegar, melba toast, milk

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 94% | 3% | a | 2% | 1% | 0.23 | 299 |
| Publ. Sch. El. Teach. | 94 | 1 | a | 4 | 1 | 0.14 | 441 |
| Priv. Sch. El. Teach. | 94 | 3 | 0 | 3 | 0 | 0.20 | 64 |

* Indicates Correct Option
a = Less Than ½%

12. Who is *LEAST* likely to be at risk for iron deficiency?
   a. infants and growing children
   b. pregnant and lactating women
   c. an 18 year old woman
   d. a post menopausal woman

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 21% | 17% | 10% | 52% | a | 0.45 | 299 |
| Publ. Sch. El. Teach. | 24 | 7 | 11 | 58 | a | 0.36 | 441 |
| Priv. Sch. El. Teach. | 19 | 11 | 8 | 63 | 0 | 0.32 | 64 |

* Indicates Correct Option
a = Less Than ½%

13. Which of the following is true about pregnancy?
   a. The only nutrient requirement which is increased during pregnancy is iron.
   b. Pregnant women should gain between 25 and 30 pounds during pregnancy.
   c. Pregnant women need not worry about increasing nutrient intake: the fetus will take what it needs anyway.
   d. Pregnant women who are obese should restrict Caloric intake so that they don't gain any weight.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 24% | 29% | 7% | 39% | 1% | 0.30 | 299 |
| Publ. Sch. El. Teach. | 26 | 36 | 10 | 27 | a | 0.18 | 441 |
| Priv. Sch. El. Teach. | 16 | 38 | 14 | 31 | 2 | 0.32 | 64 |

* Indicates Correct Option
a = Less Than ½%

14. Individuals who do not get any sunlight may be at risk for a deficiency of which nutrient?
   a. vitamin $B_{12}$
   b. vitamin C
   c. vitamin D
   d. folic acid

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 9% | 24% | 62% | 4% | 1% | 0.44 | 299 |
| Publ. Sch. El. Teach. | 9 | 18 | 66 | 8 | 0 | 0.38 | 441 |
| Priv. Sch. El. Teach. | 20 | 20 | 45 | 14 | 0 | 0.37 | 64 |

* Indicates Correct Option
a = Less Than ½%

15. Jane is tired of serving orange juice as a source of Vitamin C. Which of the following would be the best substitute?

## ORANGE JUICE

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 8

| | |
|---|---|
| CALORIES | 60 |
| PROTEIN | 1 gm |
| CARBOHYDRATE | 13 gm |
| FAT | 0 gm |

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

| | | | |
|---|---|---|---|
| PROTEIN | 0 | RIBOFLAVIN ($B_2$) | 0 |
| VITAMIN A | 4 | NIACIN | 2 |
| VITAMIN C | 90 | CALCIUM | 0 |
| THIAMINE ($B_1$) | 6 | IRON | 0 |

A. **PRUNE JUICE**

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 2

| | |
|---|---|
| CALORIES | 100 |
| PROTEIN | 1 gm |
| CARBOHYDRATE | 24 gm |
| FAT | 0 gm |

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

| | | | |
|---|---|---|---|
| PROTEIN | * | RIBOFLAVIN ($B_2$) | * |
| VITAMIN A | * | NIACIN | 3 |
| VITAMIN C | 4 | CALCIUM | 2 |
| THIAMINE ($B_1$) | * | IRON | 5 |

*CONTAINS LESS THAN 2% OF THE U.S. RDA OF THESE NUTRIENTS

B. **STRAWBERRIES**

NUTRITION INFORMATION
(per serving)
Serving Size = ½ cup
Servings per container = 4

| | |
|---|---|
| CALORIES | 45 |
| PROTEIN | 0 gm |
| CARBOHYDRATE | 7 gm |
| FAT | 0 gm |

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

| | | | |
|---|---|---|---|
| PROTEIN | 0 | RIBOFLAVIN ($B_2$) | 3 |
| VITAMIN A | * | NIACIN | 3 |
| VITAMIN C | 73 | CALCIUM | 2 |
| THIAMINE ($B_1$) | * | IRON | 4 |

*CONTAINS LESS THAN 2% OF THE U.S. RDA OF THESE NUTRIENTS

C. **APPLE JUICE**

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 8

| | |
|---|---|
| CALORIES | 60 |
| PROTEIN | 0 gm |
| CARBOHYDRATE | 15 gm |
| FAT | 0 gm |

PERCENTAGE OF U.S. RECOMMENED DAILY ALLOWANCES (U.S. RDA)

| | | | |
|---|---|---|---|
| PROTEIN | 0 | RIBOFLAVIN ($B_2$) | * |
| VITAMIN A | 0 | NIACIN | * |
| VITAMIN C | * | CALCIUM | * |
| THIAMINE ($B_1$) | * | IRON | 4 |

*CONTAINS LESS THAN2% OF THE U.S. RDA OF THESE NUTRIENTS

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 2% | 91% | 7% | -- | 0% | 0.34 | 299 |
| Publ. Sch. El. Teach. | 2 | 93 | 4 | -- | a | 0.31 | 441 |
| Priv. Sch. El. Teach. | 5 | 84 | 11 | -- | 0 | 0.31 | 64 |

* Indicates Correct Option
a = Less Than ½%

16. Which of the following cereal products contains proportionately the *MOST* sugar?

a. Ingredients: Whole Wheat, Rolled Oats, BHT

b. Ingredients: Whole Wheat, Brown Sugar, Coconut Oil, Raisins, Honey, Sesame Seeds, Cinnamon, Salt, and Soy Lecithin

c. Ingredients: Wheat Bran, Milled Yellow Corn, Sugar, Malt, Salt, Coconut Oil, Sodium Ascorbate (Vitamin C) Niacinamide, Reduced Iron, Pyridoxine Hydrochloride (Vitamin $B_6$) Thiamine Mononitrate (Vitamin $B_1$), BHA (a preservative), Folic Acid and Vitamin $B_{12}$

d. Ingredients: Sugar, Wheat, Corn Syrup, Partially Hydrogenated Soybean Oil, Honey, Salt, Caramel Coloring, Sodium Acetate, Sodium Ascorbate (Vitamin C), Vitamin A Palmitate, Niacinamide, Reduced Iron, Lecithin, Pyridoxine Hydrochloride (Vitamin $B_6$), Riboflavin (Vitamin $B_2$), Thiamine Hydrochloride (Vitamin $B_1$), Folic Acid and Vitamin $D_2$

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 2% | 17% | 2% | 79% | 1% | 0.28 | 299 |
| Publ. Sch. El. Teach. | 1 | 17 | 3 | 78 | 1 | 0.35 | 441 |
| Priv. Sch. El. Teach. | 2 | 11 | 3 | 84 | 0 | 0.33 | 64 |

* Indicates Correct Option
a = Less Than ½%

17. The following is a diet eaten by a boy in the 6th grade:

Breakfast: 1 cup corn grits
1 Tbsp. sugar
1 cup milk
½ cup orange juice

Lunch: 1 - 2" square cornbread
1 cup pork and beans
1 cup milk
½ cup collard greens

Dinner: 2 halves candied yams
3½ oz. fried pork chop
1 cup milk
½ cup peas
½ cup fruited jello

Snacks: ½ cup custard
1 pear
2 oatmeal raisin cookies
1 banana

This diet is:
a. inadequate - low in protein
b. inadequate - low in vitamin A
c. inadequate - low in calcium
d. nutritionally adequate

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 19% | 4% | 2% | 75% | a | 0.25 | 299 |
| Publ. Sch. El. Teach. | 19 | 5 | 2 | 73 | 1 | 0.27 | 441 |
| Priv. Sch. El. Teach. | 20 | 5 | 0 | 75 | 0 | 0.09 | 64 |

* Indicates Correct Option
a = Less Than ½%

18. John loves citrus fruit, but because of a truckers' strike, he can't find any in the supermarket. Which of the following locally grown foods would be the closest *nutritional* equivalent?
   a. apple cider
   b. broccoli
   c. carrots
   d. grapes

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 17% | 59% | 9% | 14% | 1% | 0.45 | 299 |
| Publ. Sch. El. Teach. | 19 | 36 | 10 | 34 | a | 0.34 | 441 |
| Priv. Sch. El. Teach. | 33 | 22 | 8 | 38 | 0 | 0.38 | 64 |

* Indicates Correct Option
a = Less Than ½%

19. Debbie dislikes carrots. What food would be the best substitute if she wanted to be sure to get the nutrients contained in carrots?
   a. apples
   b. grapes
   c. spinach
   d. celery

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 12% | 2% | 76% | 9% | 2% | 0.32 | 299 |
| Publ. Sch. El. Teach. | 12 | 2 | 66 | 19 | 1 | 0.28 | 441 |
| Priv. Sch. El. Teach. | 13 | 2 | 69 | 16 | 2 | 0.17 | 64 |

* Indicates Correct Option
a = Less Than ½%

*Questions 20 - 22 concern the following diet:*

Michael is 28 and has been a lacto-ovo vegetarian for 4 years. The following is a typical day's diet:

Breakfast: Whole wheat bread with honey
oatmeal and raisins
milk

Lunch: Peanut butter sandwiches (2)
apple juice
granola bar

Dinner: Rice and bean casserole
Whole wheat bread with butter
herb tea

Snacks: Morning: yogurt
Afternoon: graham crackers with milk

20. This diet is low in:
a. protein
b. carbohydrate
c. calcium
d. vitamin A

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 24% | 5% | 6% | 63% | 2% | 0.30 | 299 |
| Publ. Sch. El. Teach. | 27 | 7 | 11 | 55 | a | 0.46 | 441 |
| Priv. Sch. El. Teach. | 33 | 8 | 16 | 44 | 0 | 0.32 | 64 |

* Indicates Correct Option.
a = Less Than ½%

NOTE: Questions 21 and 22 refer to the diet on the preceding page.

21. If Michael has been eating a diet similar to this one since he became a vegetarian, he might be at risk for a deficiency of which nutrient?
   a. vitamin C
   b. thiamin
   c. vitamin $B_{12}$
   d. protein

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 59% | 6% | 14% | 20% | 1% | 0.31 | 299 |
| Publ. Sch. El. Teach. | 51 | 9 | 18 | 21 | a | 0.43 | 441 |
| Priv. Sch. El. Teach. | 44 | 17 | 11 | 27 | 2 | 0.44 | 64 |

* Indicates Correct Option
a = Less Than ½%

22. To improve this diet, Michael should add:
   a. brewers' yeast
   b. poultry or fish
   c. vegetables or fruit

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 5% | 24% | 70% | a | 1% | 0.35 | 299 |
| Publ. Sch. El. Teach. | 7 | 31 | 61 | 0 | a | 0.44 | 441 |
| Priv. Sch. El. Teach. | 3 | 39 | 56 | 2 | 0 | 0.38 | 64 |

* Indicates Correct Option
a = Less Than ½%

*Questions 23 and 24 concern the following diet:*

Nancy is 5'9" tall, on the track team of her high school, and practices daily. So far today, she has eaten:

Breakfast: orange juice, 2 eggs, home fries, 2 slices toast, 2% milk

Lunch: macaroni and cheese, broccoli, 2% milk

Snacks: cheese Danish
carrot cake with cream cheese frosting, 2% milk

23. Which of the following is true about Nancy's diet?
   a. Nancy's diet is probably appropriate for her age and activity level.
   b. Nancy should cut down on her cholesterol intake since she is probably at risk.
   c. Nancy should cut down on her calories: she's probably gaining weight.
   d. Nancy should increase her protein intake since she's in training.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 30% | 18% | 17% | 33% | 1% | 0.32 | 299 |
| Publ. Sch. El. Teach. | 33 | 12 | 15 | 39 | 1 | 0.26 | 441 |
| Priv. Sch. El. Teach. | 33 | 20 | 8 | 39 | 0 | 0.42 | 64 |

* Indicates Correct Option
a = Less Than ½%

NOTE: Question 24 refers to the diet on the previous page.

24. Nancy's choice of snacks is:
a. okay as long as she maintains her activity level.
b. unwise since they provide excess calories.
c. unwise because it will ruin her appetite.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 44% | 46% | 9% | -- | 1% | 0.28 | 299 |
| Publ. Sch. El. Teach. | 52 | 42 | 5 | -- | a | 0.22 | 441 |
| Priv. Sch. El. Teach. | 61 | 38 | 2 | -- | 0 | 0.27 | 64 |

* Indicates Correct Option
a = Less Than ½%

25. Which of the following is *MOST* closely associated with sugar consumption?
a. dental caries
b. heart disease
c. obesity

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 64% | 1% | 34% | -- | 1% | 0.20 | 299 |
| Publ. Sch. El. Teach. | 63 | 1 | 36 | -- | a | 0.27 | 441 |
| Priv. Sch. El. Teach. | 66 | 5 | 30 | -- | 0 | 0.37 | 64 |

* Indicates Correct Option
a = Less Than ½%

26. Obesity is associated with increased risk for all of the following *EXCEPT*:
   a. hypertension
   b. gallstones
   c. ulcers
   d. diabetes

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 18% | 26% | 51% | 6% | 0% | 0.34 | 299 |
| Publ. Sch. El. Teach. | 11 | 26 | 58 | 5 | a | 0.29 | 441 |
| Priv. Sch. El. Teach. | 11 | 33 | 50 | 6 | 0 | 0.36 | 64 |

* Indicates Correct Option
a = Less Than ½%

27. Andy is 2 years old and refuses to eat his spinach. His mother tells Andy that if he eats some spinach, he can have dessert. Andy immediately eats some spinach. What has happened?
   a. Andy has learned to like spinach.
   b. Andy's mother has found an appropriate way to get Andy to eat his spinach.
   c. Andy has learned that desserts are fattening.
   d. Andy has learned that by refusing to eat vegetables he can get something he loves to eat.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 3% | 36% | 0% | 60% | a | 0.30 | 299 |
| Publ. Sch. El. Teach. | 0 | 30 | 0 | 70 | a | 0.11 | 441 |
| Priv. Sch. El. Teach. | 0 | 28 | 0 | 72 | 0 | 0.27 | 64 |

* Indicates Correct Option
a = Less Than ½%

28. An example of the way in which the sensory qualities of a food may affect its consumption is:
   a. Bill eats whole grains because they are nutritious.
   b. Joan decides to buy some ice cream because it soothes her sore throat.
   c. Lynn eats raisins because they are high in iron.
   d. Tony takes a sandwich with him because he can't afford to buy lunch.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 6% | 70% | 16% | 6% | 2% | 0.51 | 299 |
| Publ. Sch. El. Teach. | 1 | 93 | 4 | 2 | a | 0.25 | 441 |
| Priv. Sch. El. Teach. | 3 | 91 | 5 | 2 | 0 | 0.47 | 64 |

* Indicates Correct Option
a = Less Than ½%

29. It's Jamie's birthday and her mom has spent the day preparing Jamie's favorite dinner. This is an example of:
   a. using food as a means of expressing feelings.
   b. the effect of culture on food choice.
   c. using food as a nutrient source.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 92% | 5% | 2% | -- | a | 0.19 | 299 |
| Publ. Sch. El. Teach. | 95 | 4 | a | -- | a | 0.14 | 441 |
| Priv. Sch. El. Teach. | 94 | 6 | 0 | -- | 0 | 0.00 | 64 |

* Indicates Correct Option
a = Less Than ½%

30. "Parents who care use Pal" (Breakfast Cereal). Which of the following is being used to sell Pal?
a. The nutritional content of Pal compared to other brands.
b. The psychological desire to be a good parent.
c. The economical consideration: Pal is cheaper than other brands.
d. The taste factor: Pal tastes better than other brands.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 16% | 75% | 1% | 7% | 1% | 0.46 | 299 |
| Publ. Sch. El. Teach. | 2 | 97 | a | a | a | 0.21 | 441 |
| Priv. Sch. El. Teach. | 2 | 95 | 0 | 2 | 2 | 0.03 | 64 |

* Indicates Correct Option
a = Less Than ½%

31. A severe deficiency of iron will result in which condition?
a. anemia
b. beri beri
c. pellagra
d. scurvy

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 97% | 1% | 1% | 2% | 0% | 0.22 | 299 |
| Publ. Sch. El. Teach. | 95 | 2 | 1 | 2 | a | 0.20 | 441 |
| Priv. Sch. El. Teach. | 94 | 3 | 0 | 3 | 0 | 0.18 | 64 |

* Indicates Correct Option
a = Less Than ½%

32. Which of the following is the BEST example of protein complementation?
a. eating bacon and eggs
b. eating beans and rice
c. eating peas and carrots
d. eating nuts and raisins

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 62% | 16% | 1% | 20% | 1% | 0.32 | 299 |
| Publ. Sch. El. Teach. | 35 | 22 | 3 | 40 | a | 0.25 | 441 |
| Priv. Sch. El. Teach. | 25 | 27 | 3 | 45 | 0 | 0.28 | 64 |

* Indicates Correct Option
a = Less Than ½%

33. To improve the protein quality of bread, it could be eaten with:
a. butter
b. gelatin
c. peanut butter

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | a | 0 | 99 | -- | a | 0.13 | 299 |
| Publ. Sch. El. Teach. | 1 | 1 | 98 | -- | 0 | 0.07 | 441 |
| Priv. Sch. El. Teach. | 2 | 0 | 98 | -- | 0 | 0.12 | 64 |

* Indicates Correct Option
a = Less Than ½%

34. Which of the following sources of protein requires the *LEAST* food resources to produce?
   a. beans
   b. beef
   c. eggs
   d. poultry

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 89% | 1% | 8% | 2% | 1% | 0.25 | 299 |
| Publ. Sch. El. Teach. | 86 | 2 | 9 | 2 | 1 | 0.20 | 441 |
| Priv. Sch. El. Teach. | 91 | 2 | 6 | 2 | 0 | 0.17 | 64 |

* Indicates Correct Option
a = Less Than ½%

35. Not long ago, fresh oranges and grapefruit were delicacies in Wisconsin. Today, they are available year round. This is a result of:
   a. widespread use of preservatives.
   b. increased marketability in the north.
   c. improved transportation systems.
   d. increased awareness of the importance of vitamin C on the part of Northerners.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 3% | 8% | 73% | 14% | 2% | 0.41 | 299 |
| Publ. Sch. El. Teach. | 4 | 5 | 87 | 4 | 0 | 0.18 | 441 |
| Priv. Sch. El. Teach. | 5 | 8 | 77 | 11 | 0 | 0.23 | 64 |

* Indicates Correct Option
a = Less Than ½%

36. Which of the following nutrients is most susceptible to losses in *water*?
   a. vitamin A
   b. vitamin D
   c. vitamin $B_6$
   d. vitamin E

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 46% | 8% | 31% | 12% | 3% | 0.26 | 299 |
| Publ. Sch. El. Teach. | 41 | 11 | 25 | 20 | 3 | 0.17 | 441 |
| Priv. Sch. El. Teach. | 41 | 11 | 27 | 19 | 3 | 0.29 | 64 |

* Indicates Correct Option
a = Less Than ½%

37. Food contamination may result from:
   a. mixing milk and citrus fruits.
   b. simmering foods uncovered on a stove.
   c. using baking soda when cooking vegetables.
   d. using the same cutting board for raw poultry and vegetables.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C | D* | Omit | | |
| Food Serv. Managers | 1% | 2% | a | 96% | a | 0.25 | 299 |
| Publ. Sch. El. Teach. | 7 | 5 | 2 | 86 | 0 | 0.22 | 441 |
| Priv. Sch. El. Teach. | 8 | 3 | 6 | 83 | 0 | 0.46 | 64 |

* Indicates Correct Option
a = Less Than ½%

38. An example of a benefit-risk relationship is:
   a. Sodium nitrate prevents the growth of dangerous spores in meat, but may also be carcinogenic.
   b. Artificial food colors increase the marketability of food by making it more acceptable.
   c. White flour has most of the nutrients removed during processing, but a few are then added back.
   d. Fresh fruit is available out of season when shipped from other markets but may taste sweeter.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 70% | 20% | 7% | 3% | a | 0.40 | 299 |
| Publ. Sch. El. Teach. | 76 | 15 | 6 | 2 | a | 0.39 | 441 |
| Priv. Sch. El. Teach. | 70 | 16 | 11 | 2 | 2 | 0.62 | 64 |

* Indicates Correct Option
a = Less Than ½%

39. Which of the following nutrients is most susceptible to destruction by exposure to *oxygen*?
   a. vitamin C
   b. vitamin D
   c. protein
   d. magnesium

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 53% | 12% | 18% | 15% | 3% | 0.42 | 299 |
| Publ. Sch. El. Teach. | 41 | 14 | 17 | 28 | 1 | 0.36 | 441 |
| Priv. Sch. El. Teach. | 34 | 19 | 11 | 33 | 3 | 0.31 | 64 |

* Indicates Correct Option
a = Less Than ½%

40. Which of these is most certain?
a. Too much cholesterol causes atherosclerosis.
b. Not enough vitamin C causes colds.
c. Too many calories cause obesity.
d. Too much coffee causes hypertension.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B | C* | D | Omit | | |
| Food Serv. Managers | 15% | 3% | 74% | 5% | 3% | 0.39 | 299 |
| Publ. Sch. El. Teach. | 21 | 1 | 73 | 5 | a | 0.25 | 441 |
| Priv. Sch. El. Teach. | 19 | 5 | 61 | 16 | 0 | 0.32 | 64 |

* Indicates Correct Option
a = Less Than ½%

41. In order to be absorbed, what must happen to proteins?
a. They must be broken down to amino acids.
b. They must be converted to glucose.
c. They must be attached to vitamin C.
d. Nothing - they are absorbed as eaten.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A* | B | C | D | Omit | | |
| Food Serv. Managers | 67% | 8% | 1% | 23% | 1% | 0.50 | 299 |
| Publ. Sch. El. Teach. | 81 | 9 | a | 10 | 0 | 0.30 | 441 |
| Priv. Sch. El. Teach. | 80 | 9 | 0 | 9 | 2 | 0.44 | 64 |

* Indicates Correct Option
a = Less Than ½%

42. The primary function of digestion is:

a. to separate nutrients from enzymes.
b. to break down food into a simple form so that it can be absorbed into the body.
c. to break down food to the point where bacteria may act on it.
d. to eliminate toxic chemicals from the body by means of defecation.

| Group | Percent Selecting Each Option | | | | | Item-Total Pt. Bis. Cor. | No. In Group |
|---|---|---|---|---|---|---|---|
| | A | B* | C | D | Omit | | |
| Food Serv. Managers | 5% | 92% | 2% | 1% | 1% | 0.20 | 299 |
| Publ. Sch. El. Teach. | 2 | 97 | 1 | 0 | 0 | 0.05 | 441 |
| Priv. Sch. El. Teach. | 0 | 95 | 0 | 3 | 2 | 0.41 | 64 |

* Indicates Correct Option
a = Less Than ½%